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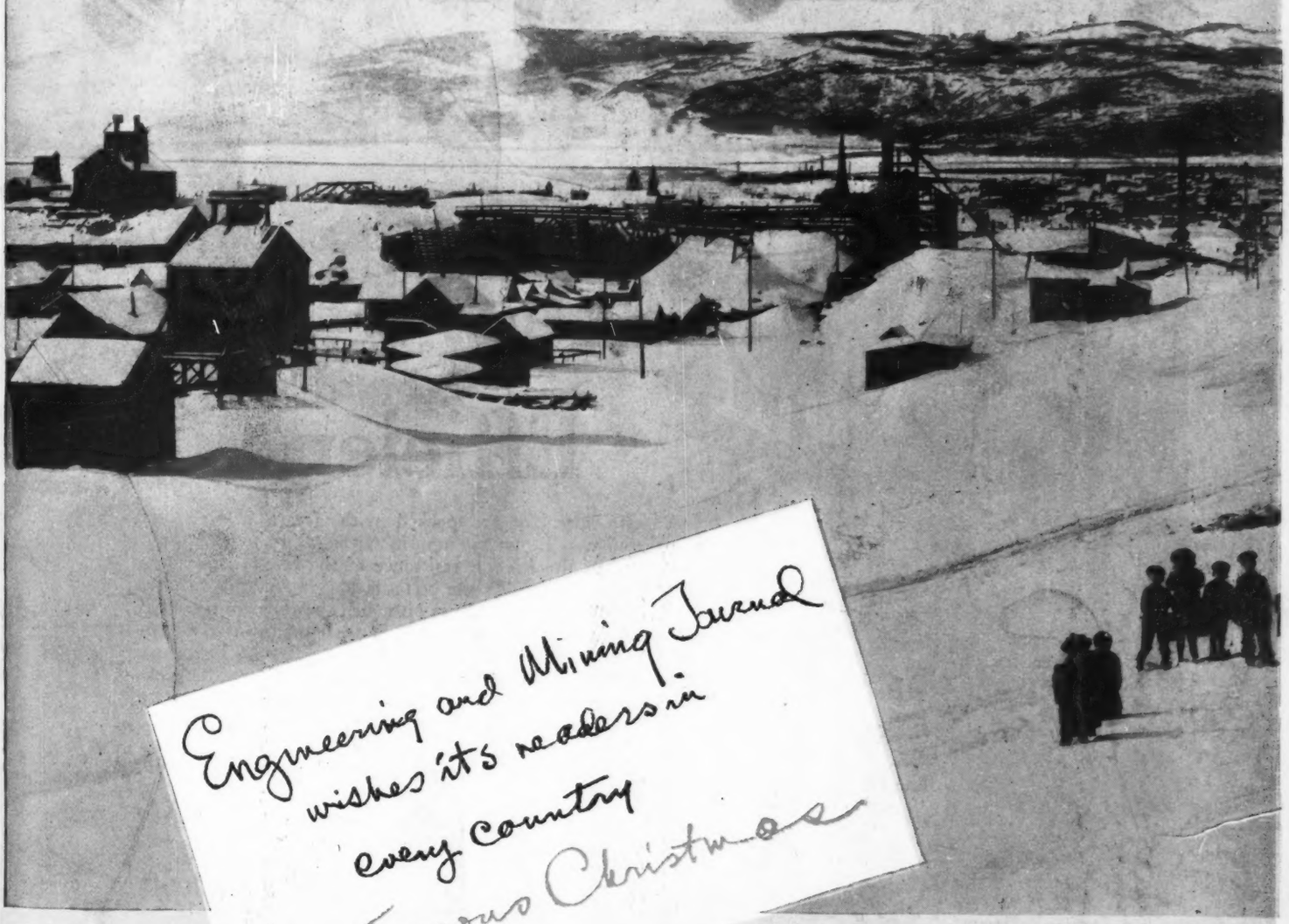

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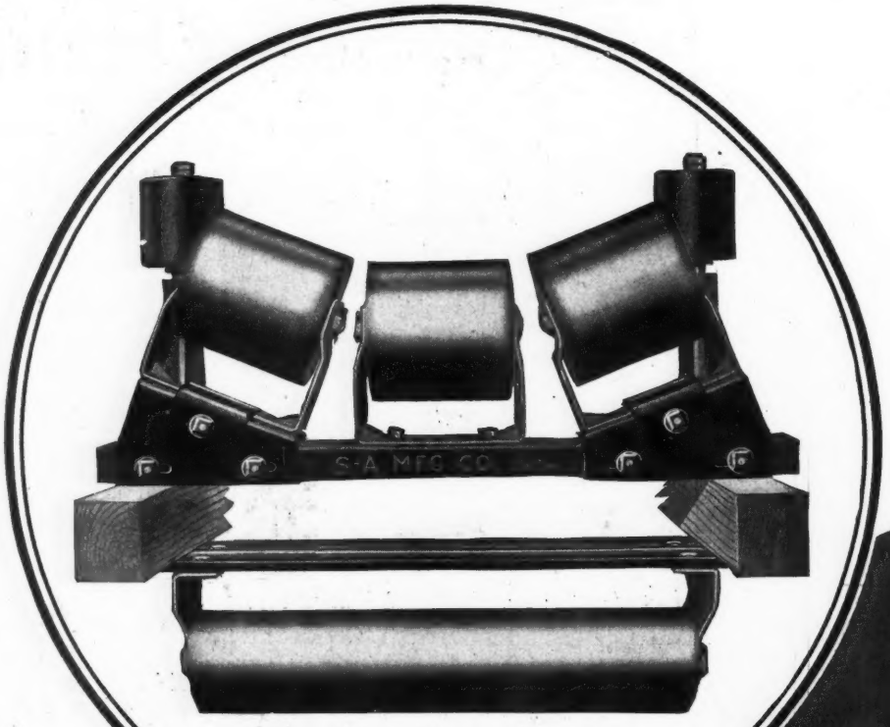

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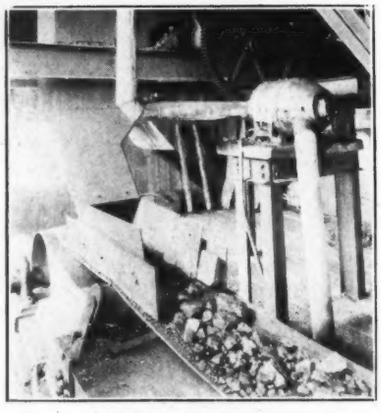

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Engineering and Mining Journal

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Volume 110 **New York, December 25, 1920** *Number* 26

Lenine and Washington B. Vanderlip

THE mystery surrounding Washington B. Vanderlip, the reputed mining engineer who stirred London, on his passage from Petrograd to New York, by his triumphant announcement of having negotiated immense mining concessions in Siberia, has been somewhat cleared up by the reports of interviews with him printed in the New York dailies, and by our own exclusive interview published in our news columns of last week. It now becomes fairly easy to valuate Mr. Vanderlip, his financial achievements, and his possible political significance.

First impressions from the cables sent from London were that Mr. Vanderlip might be a four-flusher and a drawer of the long bow; and that his stories of hobnobbing with Lenine and Trotzky, and their having figuratively turned the Soviet government inside out to please him, might turn out to be imaginary or a fabrication. But no such denial comes from Russia. Apparently all happened exactly as Mr. Vanderlip says it did. He was cordially treated, and in a most friendly and intimate way, by Lenine and Trotzky; they staged for him carefully selected glimpses of Russian conditions, and imparted to him the "true" orderly and prosperous condition of Russia, and the lamblike and ambitionless purposes of the Russian rulers, in order that he might take the boat for America and enlighten our ignorance in those matters.

It is a most dramatic episode. We all know Lenine and Trotzky, from the time they were "Reds," the former active in various cities of the Continent and the latter in New York, till the present. We know their madness, their fanaticism, their matchless cleverness, their immense ignorance and stupidity, their facility in governing by the lash the Russian ex-serfs, and their smooth facility in slipping from an impracticable communistic government to an old-fashioned military autocracy like that to which their countrymen were accustomed, without losing their own power. So we have been chiefly curious to know about the American actor in the drama. The recent revelations show him to be sober and serious, a correspondence-school "mining engineer," and a scout of experience for mineral properties. He has seen much of the world; yet his record and interviews indicate that he is neither clever nor brilliant, but, indeed, straightforward, ingenuous, and simple minded.

With all the makeshifts of changing forms of government in Russia, the colossal economic blunders of the upstart dictators have reduced that country to an industrial desert and to absolute want. The loss of all those advantages which mark civilization has been unbelievably rapid. Russia's railroads are all but gone; her cities half abandoned; her factories mainly closed; her industrial production is a mere shadow. Without assistance and new supplies produced under the "capitalistic" system of other countries Russia cannot expect to long withstand a complete collapse, and a relapse into a state of anarchy.

There are two ways for the Jolly Roger pirates to obtain the necessary plunder from abroad—by conquest or by trade. The former has been successfully prosecuted, and the spoils derived from Trotzky's many victorious campaigns have kept his vast army in those supplies which Russia can no longer produce. Had the Polish campaign finally resulted in the annihilation of Poland, as at one time seemed probable, we should have heard nothing from Petrograd concerning a resumption of trade or concessions to "capitalism." From Petrograd at that time came insolent proclamations of Russia's intention to conquer the world, including America. With Poland in Russia's hands, Germany would have revolted from the Allied terms, and Russia could have pushed forward on all her frontiers. As it is, she is resting very briefly on her arms for a new campaign against Poland in the spring, after having disposed of all her other armed enemies.

Meanwhile Russia needs further supplies, military and civil: someone must furnish her the sinews of existence and war which she has lost the power to provide for herself. With France she can do nothing. France knows clearly that Russia is a menace as dangerous as Germany was, and is frankly on the defensive. But with Russian secret agents and troops invading Asia throughout the Continent, expelling the British from Baku and threatening Mesopotamia and India, and with England's internal political and industrial troubles, Lenine sees an opportunity to force a resumption of trade with England, and so replenish his supplies. This looks expedient, even necessary, to Lloyd George, but he is bargaining hard to make the best terms he can for England. He is not going to come into close quarters with the "bear that walks like a man" without the proper safeguards.

Negotiations drag. At this time along comes the honest Mr. Washington B. Vanderlip, not a brilliant financier like the other Vanderlip, but a plain and ordinary American concession-hound. The astute (yet not sufficiently astute) Lenine, considers him attentively, as to whether he can use him. Possibly, he thinks, he can. The name suggests financial standing and influence. Lenine's political wisdom is Machiavellian; he exists, as Abdul Hamid did in Turkey, by studying the jealousies of other nations and preventing them from working together. Americans, he reflects, like the British, the French, the Germans, and the rest, are a greedy and stupid race: he does not know how much will buy them, but they can be bought. Anyhow, it will stampede Lloyd George if he thinks that the United States is going to beat England to the exploitation of Russia; so he puts one of his biggest worms on the hook. He courts the simple-minded Mr. Vanderlip, and gives him, not a

paltry concession of the ordinary variety, but a monopoly of coal, oil, and fisheries for an empire—Eastern Siberia and Kamchatka! Only, Mr. Vanderlip, you must reopen trade between Soviet Russia and the United States, which you can easily do with your Mr. Harding, now that Mr. Wilson's star has set. Explain to Americans how much money they can make by trading with Russia! And you, yourself, shall in addition have the handling of millions of dollars' worth of orders from Russia for American goods, and in these vast transactions you can let as much stick to your fingers as you think best!

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WHAT OTHERS THINK

The Causes of Gold-Mining Depression

In the Dec. 4 issue of *Engineering and Mining Journal*, referring to the Gold Conference, you write:

"Many of the speakers recited the decay of gold mining in various districts . . . without analyzing how far this decay was due to the exhaustion of ore reserves by mining."

This is correct, but is it to the point?

Excepting in special cases, it is not possible to ascertain how far lessened production is due to exhaustion of reserves. But such exhaustion of reserves, when it is uniformly apparent throughout an entire state which includes many districts in which conditions are radically dissimilar, is itself due, largely if not entirely, to depreciation in value of product. I have elsewhere shown conclusively that when mines are faced by increasing costs the management is compelled to try to keep expenses below receipts by lessened outlay in development, direct and indirect, which inevitably tends to exhaust the mine. It can stave off the evil day for a few years, but it is done at the expense of the ultimate yield. Moreover, the same conditions which eliminate the profit and reduce the life of an operating mine discourage prospecting and exploration in search of new orebodies, so that none are found to take the place of those which are exhausted.

It may be true, in a state whose production comes from relatively few mines, and where the output has fluctuated greatly, that reduced output is due to the exhaustion of ore reserves. But in the case of a state like Colorado, where the gold production for the ten years ending in 1916 was so nearly uniform, and where the number of mines and districts contributing to the total is so great, it is fair to assume that the falling off in production was not due to exhaustion of the reserves excepting in so far as such exhaustion was itself caused by the reduced value of the product.

Nor do I think you are justified in saying:

"That any call was ever made that influenced the policy of gold producers in the least is not true," or that reference to such an influence is necessarily "bunk" or "unconscious hypocrisy." Let me quote the actual words of the Secretary of the Treasury in 1918:

"At no time has this country so much required the largest possible production of gold as at present. Next to food and ammunition, gold is one of the most needed war essentials. . . . The man or the community that maintains or increases its production of gold in the face of difficulties and discouragement is performing a patriotic service which deserves recognition no less than the more obvious but not less useful services that are more in the public eye."

I think the *Journal* forgets. Perhaps gold producers did not take these words quite literally; and perhaps no man or organization deliberately faced ruin in producing gold solely for patriotic motives. No doubt other reasons, such as unwillingness to see their organizations scattered and their properties damaged by abandonment, influenced them to an equal or even to a greater degree. But to say that gold producers (equally with producers of chrome, manganese, or other "war minerals") were not influenced "in the least" by such authoritative appeals to their patriotism is to make a statement which itself, to my knowledge, is more than the truth, and is hardly worthy of the *Journal*. GEORGE E. COLLINS.

Denver, Col.

In Opposition to the McFadden Bill

The McFadden Bill, as I understand it, is intended to impose a tax, or excise, on such gold as may be used in the arts; and, from the money so raised, a bonus of 50c. per pennyweight of gold produced is to be paid to the miners or producers of that metal. Of course, any sums so collected from the makers of jewelry and other commercial consumers of the metal would be paid back to such makers by the purchasers of such manufactures of gold. It is my firm belief that a bill of that sort would be a form of class legislation, and, therefore, it would be harmful.

Both gold and silver are commodities, as well as are copper, iron, wheat, wool, cotton, and other commercial products. And if a bonus is paid to the producers of either of them, the producers of all the other commodities may rightfully demand similar bonuses for their products; all of which means taxation beyond the ability of the public to pay. This, in itself, should be sufficient to justify the condemnation of any such legislation as is proposed in the McFadden Bill.

Again, a special committee, consisting of Messrs. Albert Strauss, Edwin F. Gay, Raymond T. Baker (Director of the Mint), Emmet D. Boyle (Governor of Nevada, and, at first, an ardent supporter of the bonus proposition), and Pope Yeatman, was appointed by ex-Secretary McAdoo on Nov. 2, 1918, "to investigate the present conditions in the gold-mining industry and study the problem carefully and thoroughly with the view of definitely ascertaining all the difficulties confronting gold production and submitting suggestions of sane and sound methods of relief." Surely the committee's instructions were sufficiently comprehensive.

This committee's report is dated Feb. 11, 1919, and it seems unnecessary to quote from it any more than the two sentences following:

(a.) "Under these circumstances there is, in our opinion, no special need for artificial stimulation of gold production; and

(b.) "It is therefore the judgment of this committee that no steps should be taken by the Government to stimulate or promote the production of gold."

As is noted above, Governor Boyle at first was an ardent advocate of bonus legislation in some form; consequently, he must have had the error of his ways pointed out to him very convincingly before he signed the report of the special committee.

And now comes the recent meeting of the American Mining Congress, at Denver. One of those present at the National Gold Conference of the American Mining Congress is reported to have proposed the following (threatening?) resolution:

"Resolved, That the directors of the American Mining Congress immediately take such measures as may be necessary, in the event of the failure of passage through the forthcoming short session of Congress of the McFadden Bill, to organize the gold producers of the United States and* Alaska for the following purposes:

"A. To deposit the gold produced by them in the mint and to demand coined gold in exchange therefor."

It doesn't seem necessary to quote any more of the proposed resolution because his first "purpose," "A," seems to indicate that he was ignorant of the fact that what he proposed is simply free coinage of gold, and free coinage of gold is in existence now in these United States and has been for many years!

However, it is greatly to be regretted that persons like the foregoing "proposer" do not take the trouble to study the subject sufficiently to inform themselves correctly regarding present conditions, before advocating measures for relief.

There are some persons now living who recall the great controversies regarding free silver and bimetallism of nearly a generation ago. As measured in gold, the commercial value of silver had fallen considerably, and the producers of the latter metal sent up a howl so loud and far-reaching that, compared with it, the present cry of the gold producers is but as a plaintive bleat! Many kinds of artificial stimulation were proposed, and two or three of them, which seemed sound and feasible to the free-silverites, were tried by the Government, but without success. The reason they failed in their object was because such acts of Congress were not in conformity with Nature's laws.

Let me quote from one who wrote about free silver and bimetallism in those days, December, 1891:

"Silver, in 1874, fell to $1.27 an ounce. In 1875, to $1.24 an ounce. In 1876, to $1.15. *Then, and not until then,* began to be heard the cry of the "Conspiracy of 1873.'" [It might be said in explanation that the free-silverites and the bimetallists claimed that silver had been demonetized secretly by a Congressional clique; and they termed the act "The Crime of '73."] "Silver has been struck down, but not by the bill of 1873, nor by any bill concocted by man. The hand which struck down silver is the hand which will strike all of us down in time, the hand which nothing can withstand, the irresistible hand of Nature. Silver has been struck down by one of the natural forces, by the great law of demand and supply."

And yet the writer of the lines just quoted professed to be a bimetallist! But he could have been a bimetallist only because he failed to understand, to realize, how absolutely impossible it is, because of the natural forces to which he referred, to so regulate the world's output of both gold and silver that they will always be produced in exactly the same relative quantities, and, at the same time, to maintain the demand for them in precisely the same relative proportions.

It seems almost unnecessary to add that the late war prevented so very much production and caused such an immense quantity of destruction that the world's business is still greatly demoralized. Gradually, however, it is reshaping itself, and, when it becomes more nearly normal and deflation will have been brought about, gold will come into its own.

To find ample proof of the fact that the exchange value or purchasing power of gold is enhancing, one has only to note in the daily press the fall in prices of commodities and sundry investment securities, as well as the opposition by labor organizations to wage reductions.

But the law of supply and demand is reasserting itself, and unless another great calamity again brings about unnatural conditions, causing the world once more to resort to artificial methods for carrying on its trade, gold will sooner or later resume its normal functioning with reference to general exchange.

New York City. W. DEL. BENEDICT.

*Why does he segregate Alaska from the United States?

When Is a Lode Not a Lode?

In your editorial comment on the Bingham decision, in the Nov. 13 issue, you ridicule the contention of the Utah Consolidated Mining Co. that either or both of the limestone beds carrying the ores in dispute are broad lodes. I doubt very much if your correspondent furnished you a copy of Judge Johnson's decision, or you would have noted that at least one of the beds, the Highland Boy-Jordan limestone, has been, to a certain extent, judicially designated a lode. In the Lawson case, the Supreme Court of the United States declared the entire thickness of the Jordan limestone to be a lode. Judge Johnson, in the Leadville case, finds that the Jordan and Highland Boy limestones are "part of the same bed," meaning along the strike, "probably mineralized from the same source," and that, up to a certain dike, the Highland Boy limestone constitutes a lode.

The real issue in the Leadville case became whether or not the lode extended as far west as the Leadville country, in which area the ore occurs in the same limestone bed. Mr. H. V. Winchell, in his testimony for the Utah Consolidated, based his definition of a lode, to which you take exception, upon the long-established precedent that any area is to be legally judged to be mineral in character if the miner will expend his time and energy in prospecting it in the expectation of finding ore therein. And you will note that Mr. Winchell has limited this in his definition, to an "experienced miner, or prospector of judgment."

If the Highland Boy-Jordan limestone, 250 ft. thick, is a lode from "underlying quartzite to overlying quartzite," the thickness of the Yampa limestone, 280 ft., would not, of itself, bar the limestone from coming under the same classification. A. E. ROBINSON.

Tooele, Utah.

Should Claim Assessments Be Postponed?

If there is anything you can do to prevent the passage of the bill to suspend the annual assessment work on mining claims I wish you would do it. I was employed by a copper company until the first of the month. Yesterday I met an acquaintance on the street, and I said, "Have you done your assessment work yet?" Said he, "No, I cannot get men to do it; miners are so scarce." So I said, "I will go to work for you, and I will get you all the men you need." "Well," said he, "I will wait. I think they will pass a bill so we won't have to do the annual work, and then I can go to California on that money and spend the winter there."

Now, this is just what has killed mining and prospecting. The claim hogs hold the country and won't develop and won't let any one else have the ground. The country is full of unemployed miners. Kindly do the best you can to save the mining and prospecting game.

WESTERN MINER.

Moving Pictures in the Mining Industry

The article, "Moving Pictures in the Mining Industry," which appeared in *Engineering and Mining Journal* of Dec. 4, is very timely. It could be broadened to include what the infernal Germans did in promoting sales of mining and electrical machinery before the war. I have seen beautiful films of the Krupps plant, with plentiful pictures of "modern mining machinery" which would not compare with the products of any Colorado foundry for strength and practicability. The films were supplied gratis to the moving-picture man. If it is remembered that in Santiago, Chile, practically every man of financial importance is a shareholder and director in a tin mine, the possibilities of this film propaganda will be appreciated. No films were available from the Colorado Iron Works, Chalmers & Williams, Hardinge or Allis-Chalmers, and the latter alone made twenty times as much mining machinery as Krupp, and it was four times as good. Even Humbolt, in Germany, sent out films.

Of course Siemens-Shuckert had frequent new films; and the General Electric and Westinghouse, both of which make *reasonably* good and *fairly* large quantities of electrical machinery, were noticeable by their absence.

Recently I have sent out a number of moving-picture machines to mines situated away from towns. The equipment with spares costs about $600. It seems like a stiff price to pay for entertaining such rough-necks as miners and mining engineers, but let us examine the matter in a little detail.

One of the mines is a day's journey from the railroad. It employs 2,000 men, mainly Bolivians, with a sprinkling of Chileans and a score or more Europeans. As there are no theatres, churches, or ball games, the majority pass evenings and holidays in the usual pastimes of mining camps—wine, women, and noise. Of course they *should* all be taking correspondence courses in order to become mining engineers, but they do not. Even booze and women get monotonous (especially the same women), and this accounts for much of the exasperating labor turnover.

In such a camp, a moving-picture machine is a big asset for the company. An admission is charged, which more than pays expenses of operative and film rent, and the hall is packed every night. The show closes early, so the men will get plenty of sleep and be on the job in the morning, and this is far better than allowing them to fall into the hands of designing saloon keepers, gamblers, and beautiful (?) women. It has proved possible, as a result of providing amusement for odd moments during the day and evening, to persuade the laborers to save part of their wages and even to invest it in shares of the company.

I know of one company which has such a machine. The company is planning a large new mill for tin concentration which will cost about £100,000. If I were a manufacturer of concentration tables, I certainly would send that company a film of my wonderful tables in operation. The miners might not get much from the film, but the manager, the mill foremen, and the shift men would immediately feel acquainted with my table.

The enterprising salesman of the enterprising manager of the enterprising company making a certain shovel once had the nerve to bring two shovels to my office and test them before my eyes on my own nice Wilton rugs. I must not tell you the name of the shovel, because advertisements are not allowed in these columns, but you all know the color of the edge of the shovels.

Well, the test consisted of using two different makes of shovels alternately as axes, chopping each other on the edges. The result was a revelation of steel quality. Whenever I see two shovels near each other now, I want to chop them together. Once, in France, this salesman's detachment was digging a trench in frantic haste when it occurred to him to investigate the quality of the shovels in his neighborhood. The development of the idea made a fine story, which the captain tells to this day. If this test and the two other tests invented by this same manager were filmed and loaned to the mining companies, the market not only for their shovels but for all shovels would be greatly increased.

Not long ago, a film was made showing underground and surface coal-handling equipment for the special education of French engineers, in the hope that their increased knowledge would assist them in choosing the best mining equipment. They got the education, but the resulting business barely paid for the picture. This was not the fault of the pictures, the idea, or the Frenchmen, but the blame lies with the Germans, who have deceived the poor French nation into thinking that they (the Germans) will repair all the damage done in the coal fields, at German expense with French machinery.

No machine films better than a pneumatic drill. A few feet of film cut out here and there, but judiciously, turns an ordinary drill into a wonder and gains for it a rapturous round of applause from the miners.

Smoke precipitations would make a spectacular film and would be of interest to smelters everywhere, but the smoke people are so very very scientific and so very very uncommercial that the suggestion simply wastes paper.

Hoisting, track, and standing rope is hard to sell because so many rope makers make good rope. A film showing a modern rope walk would surely gain friends and business and would differentiate one manufacturer from all the others.

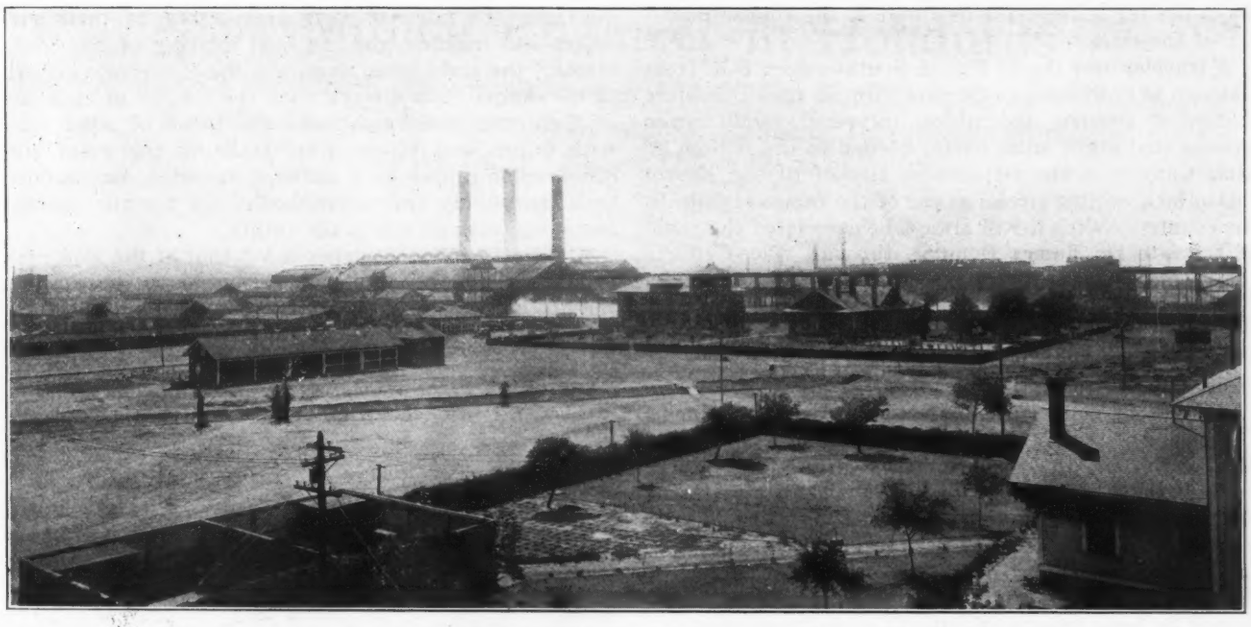
The Holt company is going to have a fine opportunity this winter to film about fifty of its tractors which the City of New York has purchased to push snow.

All such films should make the circuit of all the mining towns of the world. A little patient investigation on the part of the *Engineering and Mining Journal* would provide a list of every mining-town picture machine. The *Journal's* subscribers would be glad to send the addresses, and these could be supplied to your advertisers as a Christmas present without annoying your advertising department. MARK R. LAMB.

New York City.

About 120 Grams of Radium Produced

Since Mme. Curie discovered radium, in 1898, the total amount of radium that has been produced is about 120 grams, and supplies are steadily increasing, according to the *Journal of the Röntgen Society*. The total output of the Standard Chemical Co. (Pittsburgh Pa.) up to 1920 is reported to be 50 grams of radium element, and although its present output is only 18 grams per year, the company is said to be preparing to produce 50 grams of radium element yearly, should the demand justify it. Since 1913 three new radium factories have been started in America and several in France, where an average of 18 grams of radium per annum was produced during the war.



THE COPPER QUEEN SMELTER OF THE PHELPS DODGE CORPORATION, DOUGLAS, ARIZ.

The Power of Copper

BY GRAHAM JOHN MITCHELL
Written for *Engineering and Mining Journal*

A FEW YEARS AGO the average citizen was likely to derive his conception of the value of copper mainly from the stock-market reports, the metal itself as a commodity meaning little to him. Then, with the coming of the war, he learned to think of copper in its use as a great destructive mineral, through lack of which Germany was greatly handicapped in her military campaign, whereas the United States had enormous supplies and large producing mines which could continually replenish her supply. But now, in the days of reconstruction, he must readjust his point of view and think of copper not in the light of its destructive uses but in its decidedly constructive significance. Practically all of the communities where it is mined have been established by the copper industry. Few of them would be in existence were it not for the mines around which they have been built.

Take, for example, the copper centers of Arizona, the state which leads in the production of this mineral. In 1919, Arizona produced 536,515,368 lb. of copper, which was 40.9 per cent of the total output in the entire United States for that year. If one were to attempt to picture the present mining centers of Arizona before the mines were discovered, the result would resemble the many familiar paintings of "The Arid Southwest" which adorn nearly all art museums. There would be a rattler devouring a jack rabbit, with a gila monster looking enviously on, and cacti and sage brush with stretches of desert waste would complete the picture. How different is the present-day panorama, with its modern cities and thriving communities built because of the copper mines!

No better single illustration of the effect of the copper industry in developing a district can be found than the city of Ajo, in southern Arizona. Eight years ago what is now a model town was a sand and sage-brush covered flat, dotted here and there with occasional miners' cabins. Copper was mined at Ajo as early as 1854 by the Arizona Mining & Trading Co., which, however, could work merely the high-grade ore, as only such ore could stand the cost of transportation to the nearest point for shipment. After all the high-grade had been extracted, the mines were closed down, and as short a time ago as 1912 the old site of Ajo was practically deserted. To reach it one was forced to drive over a long, hot fifty-mile stretch of desert, the town of Gila being the nearest rail station.

An almost unbelievable transformation has been wrought during the last few years. Today a branch railroad runs directly to the town, and the visitor alights at a beautiful modern station. Ajo is a "company town" in the broadest sense of the word. It is laid out not merely to exploit the mines but on the theory that ideal working conditions and attractive surroundings do much to draw the highest type of workmen and to promote a spirit of harmony and satisfaction among them.

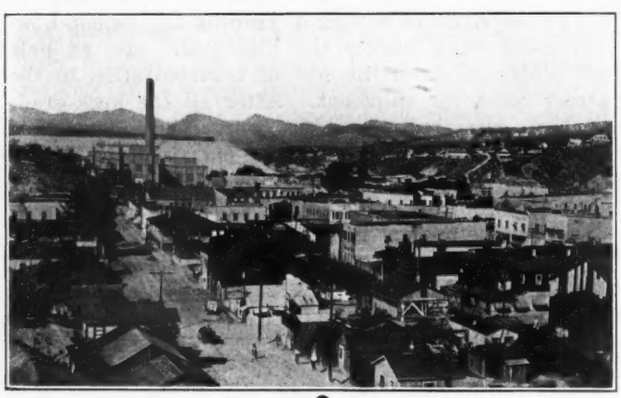
The general type of architecture of the company buildings is Spanish mission. There is a central park or plaza, with the stores and public buildings grouped around it. Farther back are the homes of the employees, and beyond are the "hills of copper," where steam shovels load the ore into cars which transport it to the extraction plant. Modern mining and metallurgical methods, backed by executive and engineering ability, have developed a system whereby the low-grade ore could be worked profitably, and, as a result, Ajo, one of the most unique copper-producing plants in the world, was built and a new and thriving community added to Arizona. The town and the New Cornelia Copper Co.'s mines stand as a tribute to the foresight and ability of Col. John C. Greenway, who was largely re-

sponsible for adding this new unit to the copper industry of the state.

A traveler over the El Paso & Southwestern R.R. from Chicago to California could pass through the diminutive station of Osburn, and, unless informed, would never suspect that eight miles north, nestled in the bottom of Mule Canyon, is the picturesque city of Bisbee, known throughout mining circles as one of the famous camps in the country. With it will always be associated the name of the late Dr. James Douglas, through whose efforts the Copper Queen Consolidated Mining Co. was developed. In later years this company became a part of the larger Phelps Dodge Corporation, which has taken a prominent part in Arizona's progress, under the leadership of Walter Douglas.

Millions of dollars are invested in Bisbee by Phelps Dodge and its sister producers, the Calumet & Arizona Mining Co. and the Denn-Shattuck Mining Co. These organizations have made possible a modern city in the heart of an otherwise desolate region. The El Paso & Southwestern R.R., from El Paso to Tucson, would never have been built were it not for the need of an outlet for the products of these mines. This road, which is surpassed by none from a standpoint of railroad construction, forms the present westernmost link in what will some day be a through rail system between Chicago and southern California.

A short distance east of Bisbee is Douglas, known in the southwest as the "Smelter City," chosen as the location of both the Copper Queen and Calumet & Arizona smelters, and it is around that branch of the copper industry that the city has grown. North to Miami are the Inspiration Consolidated and Miami properties, two



A VIEW OF MIAMI, ARIZ.

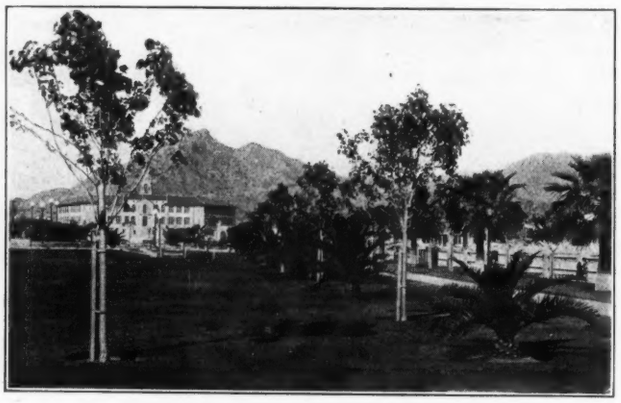
large low-grade copper mines. In this section of the state are also Ray Consolidated, at Ray, and the mines at Globe, both leading copper producers.

To the east of the Miami district are the Clifton-Morenci mines. Farther north at Jerome are the United Verde and United Verde Extension, the former having been developed by ex-Senator W. A. Clark and associates and the latter largely due to the efforts of James Douglas. These mines have, like those at Bisbee and Ajo, been the keystone in the growth of their respective communities.

The part copper has played in the development of Arizona has its parallel in various other states, such as Michigan, Montana, with its rich mines at Butte, and Utah, where are situated the famous Bingham Canyon deposits.

There is a thrill of romance about copper mining districts—the tales of early prospectors, of their successes and failures, and the final locating of the "pay-streak," the early boom days, and the mushroom growth of the camps. But always, with the history of each one of them, has been associated the name of some man with brains and vision, who, realizing the great significance of copper as a national resource, has builded both thoroughly and scientifically, not for the present alone, but with an eye to the future.

And so the story of copper is not that of the gold rush to Alaska, not the spectacular dash to be the first on the ground, but an even, steady growth, backed always



THE PLAZA AND SCHOOL AT AJO, ARIZ.

by a capable organization working with perseverance to build up a permanent industry.

The importance of copper has hardly yet been realized. Its possibilities are so great that they can scarcely be listed in so brief a presentation. Probably its most important work will be in connection with the increasing use of electrical power. No other agent has been found which can approach it as a suitable conductor of electricity, the motive power which will move the world during coming generations.

Because of the vital necessity of copper in world industry, the present depression in the copper industry can, at the most, be only temporary, and, after the period of readjustment, it is safe to predict that the demand for copper will be greater than ever before.

Bahia as a Mineral and Precious Stone Producer

Bahia, Brazil, is an important South American trade center, and is situated in a region rich in minerals and oil-shale deposits which have not as yet been developed. Diamonds and carbonados, monazite sand, manganese, and chrome ore are some of the minerals exploited and exported. Bahia is the only region in the world where the carbonados ("black" diamond) are found. They are harder than white diamonds, are used in diamond drills, and are worth almost as much as those of the finest white variety.

Exports of minerals to the United States in 1918 and 1919, according to Consul Thomas H. Bevan, follow:

	1918		1919	
	Quantity	Value	Quantity	Value
Chrome ore (tons)	13,200	$709,224	1,000	$56,719
Manganese (tons)	53,053	2,409,546	7,330	297,176
Bortz (carats)	738	9,232	375	2,026
Carbonados (carats)	10,752	475,505	10,859	530,170
Rough diamonds (carats)	10,366	318,525	10,684	471,181
Industrial diamonds (carats)	.....	.....	126	3 853
Tourmalines, etc. (carats)	.....	.....	133,475	8,599

A Mining Engineer in Honduras

Impressions of a Brief Visit—Country's Wealth, If Any, Not Readily Apparent—Transportation Facilities Poor and Population Scanty—Customs of Inhabitants Primitive —Native Dairy Hygiene Offers Hope of Progress

By Paul T. Bruhl
Written for *Engineering and Mining Journal*

PASSENGERS between New Orleans and Puerto Cortes are conveyed by steamers operated under the Honduran flag by the Cuyamel Fruit Co. Shortly before the tug which was to convey us upstream from the landing to the fuel-oil station arrived on the scene, a tanker, in avoiding a ferry, crashed into the steamer moored at a wharf just ahead of us. Considerable damage resulted.

Early Sunday morning we got under way, but an hour later engine trouble developed, which caused a short delay. The stretch of the Mississippi between New Orleans and the sea is 110 miles long and from three-quarters to one mile wide. The water was unusually high, and in some places, indeed, it seemed as if only a few buckets more would cause the river to inundate the adjoining lands. It is a curious sight to see houses along the levee standing below the river level so that one can look in at the upper windows.

TEGUCIGALPA, CAPITAL OF HONDURAS

The scenery is rather monotonous—vast flat fields or wide expanses of tangled undergrowth. Vessels ahead, following the sinuous course of the stream, present the optical illusion of seeming to be at a higher elevation.

At the lower pilot station, situated eighteen miles from the mouth, a change of pilots is made. At this point the channel narrows down to about 300 yards. A few miles out at sea one crosses a clean-cut line of demarkation between the muddy river water and the soiled green of the Gulf.

Early on Tuesday morning the first land was sighted. It was the Island of Contoy, off the low-lying mainland of Yucatan. On the evening of the following day we made Puerto Cortes, where after a perfunctory medical and customs examination we went to a hotel. The town partially encircles the bay and consists of bungalows on either side of the railroad track. The vegetation is tropical. The ground, marshy in places, is rendered beautiful at dusk by swarms of fireflies. The south side of the bay is bordered by fairly high well-wooded hills. The entrance to the hotel is given over to a bar, the sight of which to the newcomer from the United States is, as it were, a lifting of the veil which shrouds the past.

In the patio the chickens and turkeys lead their precarious lives, and their early morning bickerings make an alarm clock unnecessary—at first, at any rate.

I left Puerto Cortes in the Ferrocarril Nacional de Honduras, a line which I understand has been taken over by the fruit company. The track is not in the best condition at present, as the roadbed consists of tamped earth. It is said that formerly the passengers were obliged to wear spurs so as to secure a good grip under the seat when the train was in motion.

The boiler is wood fired. The engine made curious spasmodic spurts as if the engineer realized at intervals that he was not running on time and wished to remedy the situation.

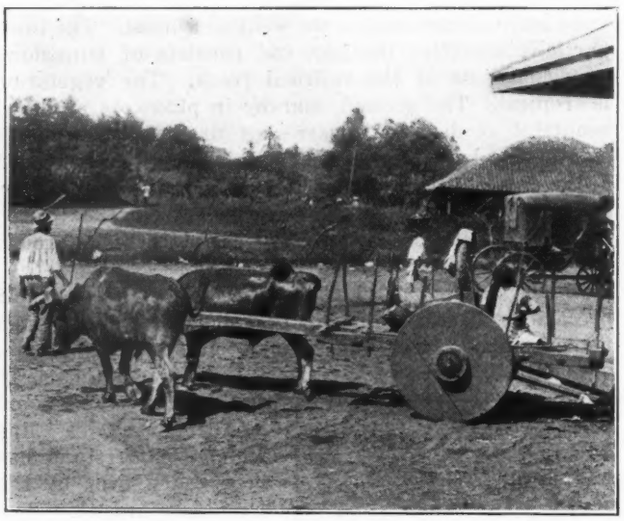
We passed at first through banana plantations and by heavily wooded hills, but further along the vegetation became less dense and the foreground was dominated by the stately and beautiful native palm.

At San Pedro Sula, a thriving town of about 4,000 inhabitants, I changed trains for Potrerillos, the end of the line, thirty-five kilometers further on. Potrerillos is a typical village with a few whitewashed houses, either thatched or covered with home-made tiles; a place of no interest whatsoever to the passer by, and noticeable chiefly for the want of any distinguishing feature.

Al-Fresco Accommodations

Owing to a late start, due to the failure of the *mozo* to put in an appearance at daybreak, I stopped for the night at Rio Blanco, about twelve miles away, and obtained hospitality at the ferryman's very modest habitation. The yard was in full possession of an

intimate group of children, goats, monkeys, poultry, and pigs. I passed the night in a hammock slung out-of-doors, and the mosquitoes saw to it that my rest was broken and fitful. I rose at daybreak and paddled a canoe downstream in an endeavor to whet an appetite for the inevitable beans and tortillas. The river, which was in fact no wider than a brook, was overhung by trees, through the leafy branches of which the sunlight struggled with difficulty. It was too sombre to be



THE COW SPECIAL

entirely enjoyable, and I was glad to return to the breakfast that was now in course of preparation.

The kitchen stove was made of stone and clay, and as there was no chimney the smoke curled lazily to the roof, where, caught in little eddies, it was hurried into the outer air through the many crevices in the thatch. The beds were of the simplest design—one-inch poles laid lengthwise on crosspieces, with a mat inadequately serving the purpose of a mattress. Alongside the bed was a hammock cradle just a few inches above the floor. One could not help feeling sorry for the baby, exposed as it was to the inquisitive nose of every wandering pig.

I got away at 6 o'clock and traveled along a fairly good road, occasionally rocky, that made a gradual ascent to the small town of Santa Cruz. The hills at first appear to be a jumble of peaks, but gradually they straighten themselves out into some semblance of order, and one can trace out the various ranges. Some good cattle can be seen along the wayside, but owing to the dry season they seemed to be suffering from lack of nourishment.

After lunch I rode a further twenty miles over some very rough ground to the resting place for the day. In the early night a thunderstorm awakened the echoes of the surrounding hills and obliged me to sleep *en famille* with my hosts. One is, of course, in complete privacy when the light is turned off, but as there was no light at all, not even a splinter of pine or a guttering candle, the privacy one enjoyed might even be said to have exceeded 100 per cent!

HONDURAN LEAGUE A VARIABLE QUANTITY

The next day I reached Cuevas, distant about thirty-two miles. Here I may remark upon the elasticity of the Honduran league. The Irishman, we know, rejoiced that he was at least keeping up with the place. In Honduras at times one's objective actually seems to get away from one. It is a little discouraging to ride for an hour on a none-too-attractive mule only to find that the next village has increased its lead by a league or two. In Chile, the traveler on asking the distance to his destination is told *"Dos horas mas,"* or *"Tres horas mas."* In Bolivia, the Indian usually replies *"Quien sabe."* Both forms are preferable to the Honduran *"legua,"* which is too much subject to purely local interpretation.

Some of these *leguas* unraveled their uncertain length through woods redolent with the scent of pine. The country, although still sparsely inhabited, appeared to have more frequent patches under cultivation with sugarcane and corn. There was, however, no organized work, and as the people cannot raise with certainty more than suffices for their personal needs, their existence must be one in which ready money plays but an inconspicuous part.

Cuevas, a village, is the proud possessor of a church, a whitewashed structure with an impossible pair of plaster angels reclining over the main entrance. Cows are used for "snaking" logs. There is a brotherhood existing between the men who snake logs. My Spanish is not fluent, but I am positive that the sentiments that the man was endeavoring to express were identical with those held by the man I met last summer in the pine woods of Georgia.

DR. DARLINGTON'S INFLUENCE FAR FROM HOME

In the evening I saw a woman sit down to milk a cow. She was about to begin without any of the preparations considered necessary by the Board of Health, but at the last moment, her soul nudged, perhaps, by the spirit of some hygienic ancestor, she wiped the udders—with the tuft at the end of the animal's tail! She did not do it furtively but with an

MILL OF NEW YORK & HONDURAS ROSARIO MINING CO.

earnest deliberation. Yet we say that half a loaf is better than no bread.

The next day, an eight-hour ride along a trail that clung to the rocky edge of precipices or followed the grassy banks of a stream brought me to the town of Comayagua, which years ago enjoyed the distinction of being the capital. It is not a large town nor a busy one, and the inhabitants spend, I think, a few moments

of each day in wondering why the seat of government was removed to Tegucigalpa. There are two large churches belonging to different ecclesiastical orders. The cathedral fronting the plaza is inclosed by a fence made out of the barrels of old Spanish muskets. The high altar within is prettily, if a little garishly, decorated. At the other church there used to be a valuable Murillo. Its genuineness was unfortunately recognized by some unprincipled collector.

Wayside Crosses Frequent

I left Comayagua by automobile at 1 o'clock the following afternoon, and followed the valley till we came to the range that had to be crossed. The road winds up the mountain side through pine woods where the air is cool and invigorating. All the bridges, a few of them of stone, were in good condition and well cared for. One could not but be impressed by the number of crosses, each marking the resting place of the party of the second part in some wayside difference of opinion. I am informed, however, that every cross does not necessarily indicate a violent end—some of the departed may have met death as the result of a perfectly legitimate illness. However, that may be, I think that the custom of erecting these crosses creates an erroneous opinion in the minds of foreigners as to the degree of culture of the natives. A similar custom adopted in some other towns I know would cause a radical change in the scenery.

The men in Honduras go about armed either with a revolver or with a machete. I cannot see the need for so lavish a display of artillery, but I am told it is advisable, inasmuch as it discourages the acquisitive tendencies of a certain class. The high cost of marriage fees causes the marriage ceremony to be dispensed with in many instances, so that mutual consent is regarded as an adequate substitute for the blessing of the Church.

From what I have seen of Honduras it is not as yet in fact a rich country, whatever its potentialities may be. The great lack of transport facilities and the paucity of numbers of the inhabitants are two obstacles in the way of financial progress. I am indebted for the photographs to Mr. S. Weld.

Numerous Mineral Deposits in the Malaga District, Spain

The western district of Malaga, Spain, contains the Serrania de Ronda mining field, in which nearly all kinds of mineral deposits may be found, such as lead, copper, zinc, antimony, nickel, gold, and platinum, according to *Commerce Reports*. During the last four years the Spanish government did not permit prospecting, and concessions could not be obtained. Only lately has this district been opened to prospectors, with the result that a number of mining companies have sent their engineers to investigate and report.

The northern part of the Province of Malaga is rich in red oxide of iron ore; the mines of Salinas, Archidona, and Rio Frio are well known. The ores found in this district are exported for use in the manufacture of paints. The eastern district of Malaga contains lead, iron, and zinc mines which are north of the town of Nerja and extend into the Province of Granada, where, east of Nava Chica, altitude 1,831 meters, many undeveloped lead, zinc, molybdenum, and vanadium concessions are located. The southern and central districts of Malaga, northeast and southwest of Santa Pitar, altitude 1,020 meters, also contain a number of lead, zinc, and copper deposits, most of them not yet sufficiently examined or developed.

The lack of proper transportation facilities and good roads is a drawback to the development of these mining districts. In many instances the ore has to be hauled to the railroad station in ox- or mule-drawn carts, or carried on muleback, for a distance of three to twenty-five miles at a cost of $2 to $10 per ton. Many of the mineral deposits in Spain are far from being exhausted, and only await the necessary capital, machinery, and aggressive action to make them successful investments.

In these districts there should be favorable opportunities for the sale of American motor trucks and tractors, to be used in overcoming the present difficulties in transportation, due to the lack of railroad cars and equipment. American mining machinery and supplies should also find a ready market, as, on account of the difficulties in obtaining machinery during the last few years, many mines have run short of equipment.

Decline in United States Gold and Silver Production

Final figures showing the production of gold and silver in the United States were recently issued by the Bureau of the Mint and the U. S. Geological Survey. They show that the production of gold in the United States during the calendar year 1919 totaled 2,918,628 fine ounces. The silver production was 56,682,445 fine ounces. The figures are as follows:

State or Territory	Gold		Silver	
	Fine Oz.	Value	Fine Oz.	Value(a)
Alaska	481,984	$9,963,500	690,151	$773,570
Arizona	222,965	4,609,100	5,702,911	6,392,222
California	841,638	17,398,200	1,153,614	1,293,051
Colorado	495,810	10,249,300	5,966,606	6,687,790
Georgia	34	700	8	9
Idaho	34,085	704,600	5,933,078	6,650,207
Illinois	0	0	6,000	6,725
Maine	10	200	4,142	4,643
Michigan	0	0	425,610	477,054
Missouri	14	300	75,991	85,176
Montana	116,918	2,416,900	15,012,258	16,826,790
Nevada	225,384	4,659,100	7,045,395	7,896,972
New Mexico	28,319	585,400	851,821	954,781
North Carolina	5	100	19	21
Oregon	53,029	1,096,200	236,620	265,220
Philippine Islands	41,119	850,000	15,715	17,614
South Carolina	5	100	2	2
South Dakota	255,889	5,289,700	122,068	136,822
Tennessee	271	5,600	97,554	109,345
Texas	19	400	539,483	604,690
Utah	109,661	2,266,900	12,542,623	14,058,650
Vermont	19	400	2,200	2,466
Virginia	0	0	8	9
Washington	11,436	236,400	258,270	289,487
Wyoming	14	300	300	336
Totals	2,918,628	$60,333,400	56,682,445	$63,533,652

(a) Valued at the average New York price of fine silver, $1.12087 per oz.

Compared with 1918 production these figures indicate reduction in gold output of $8,313,300, and in silver output, 11,127,694 oz.

Federated Malay States Tungsten Exports

The total export of tungsten ores from the Federated Malay States, as shown by the customs returns, was 355.41 tons in 1918, as against 761.31 tons in 1917, according to the Bureau of Foreign and Domestic Commerce. Of this total wolfram accounted for 244 tons and scheelite the remainder. Export duty on tungsten ores was not exacted, and free prospecting licenses continued to be granted.

Mining Experiences in Idaho in the Nineties

Narrative of Difficulties and Happenings at an Old Gold Mine—Transportation Over High Mountain Ridges—Isolation in Winter—Novel Method of Packing In an 8,400 ft. Wire Cable

BY G. L. SHELDON
Written for *Engineering and Mining Journal*

THE Yellow Jacket Mine, in Lemhi County, Idaho, was purchased by friends of mine in October, 1892, and shortly after I was sent in to take over the property and start work. Ketchum, Idaho, on a branch from Shoshone on the main line of the Oregon Short Line, was the nearest railroad point. From Ketchum it was eighty miles by stage to Challis; thence by horseback, over a trail sixty miles long, across three mountain ranges from 9,000 to 10,000 ft. in altitude, to the milling plant of the property on Yellow Jacket Creek, at an altitude of 8,000 ft. The mine was on the mountain 1,200 ft. higher. The ten-stamp mill on the property had been put in by J. B. Haggin in 1866. The former owners, after working two weeks in cleaning up the mill, turned it over to us. In four days we cleaned up $3,000 from around the batteries.

In summer the ore was hauled from the mine to the mill by wagons and in winter by sleighs, at a cost of $2.50 per ton. It was decided to erect a Swem aërial tramway, the buckets to carry 125 lb. of ore each. No packer would contract to deliver the ⅞-in. wire cable required in its construction. The company's pack train brought in the cable, 8,400 ft. in length, in three trips. Being too stiff to coil for individual coils on each mule, it was strung out upon the main street of Challis, six or seven runs on a side being tied together. The mules were placed in the center, with the cables lashed to each side, the loop at either end swinging clear of the leading and the end mules. Nearly all the inhabitants of the county were on hand to see the pack train start. They had plenty of excitement and fun. It took two men to manage each mule for the first few days. On uneven ground the individual loads would vary in weight. In a hollow the rope would lift the center mule off its feet. On a ridge or knoll one mule took the load of three. One wall-eyed cuss bucked and tore around on a ridge, throwing the whole pack train of twenty-two mules down the mountain 150 ft. into the timber in a tangled, twisted condition. It took two days to cut them out, no serious damage being done.

Owing to the stiffness of the several cables bound together the pack train could not make short turns, and a temporary straight trail, regardless of grades, was therefore made. Eventually the mules became accustomed to the novel loading, and the entire cable was delivered without serious mishap. The tramway reduced the transportation cost for delivery of the ore from mine to mill to seven cents per ton.

HARD SLEDDING

During the following January I went in again as confidential man, cashier, and bookkeeper. At the time snowshoes were required. I used the long six-foot Canadian web shoes. Along the route there was a cabin with provisions every fifteen miles. It was the hardest four days' work I ever did; but afterward, when I learned to use skis, I found them much easier.

Early in the spring of '93 our provisions began to run low. Supplies had been purchased for fifty men, but the superintendent often had a hundred. There were finally only potatoes, oatmeal, and some rusty "sowbelly" that had been in the warehouse for five years. I have never been able to eat "sowbelly" since.

The trail over the Yellow Jacket Divide was shoveled out to permit the pack train to get through. Before it reached the divide a "chinook" blew for two days and cut all the snow out. Clearing the trail had cost $1,200. We went over into the Basin, where deer wintered, and shot some. That helped out our larder.

Before the next winter it was known exactly how much sugar, butter, flour, baking powder, and other provisions were necessary per day per man, and supplies were purchased accordingly. The provisions for seven months had to be laid in by Nov. 25 of each year. This applied also to every article needed at the mine and mill, even to window glass and tacks.

PAYING UNDER DIFFICULTY

Early in June of '93 (the year of the panic) trouble began over certain checks upon which payment had been protested. I went to the railroad and, by telegraphing, secured by express from New York a few thousand dollars in currency. Under the terms of the purchase contract of the property, all of the gold bullion produced had to be deposited in the Wells Fargo Bank at Salt Lake within a certain time each month, and credited on the balance due upon purchase price of the property. Unless this had been done the property would have been forfeited.

Upon returning to the mill, I found that the superintendent had held the bullion, hoping to make sure of his own and his friends' pay. I paid him in full and discharged him. A man on horseback, together with another horse upon which the bullion was packed, was dispatched with instructions to proceed to Salt Lake without delay. The bullion reached the bank upon the last day of the forfeiture period, after banking hours. The bank being advised by wire, received it, and saved the mine. The owners were wired about the incident and informed me that I was in charge. I remained as superintendent until the mine again changed hands in May, 1895.

The old cam shaft on the stamp battery had been in use so long that key seats had been cut all over it, and there was room for no more. A new shaft was purchased. This weighed 625 lb. Jesus Urquida, a Mexican, was the only packer who would bring it in. He secured the largest mule in the locality. He then made two tripods the height of the shaft when loaded. These were packed on another mule. The big mule was led with the load, one, two or three hours, depending upon the condition of the trail. Urquida would then stop and set up the tripods just behind the loaded mule. Four men would next slide the shaft back onto the tripods. The mule was then allowed to rest and feed for a short time and the procedure repeated.

The mill was operated by a Leffel water wheel, which was connected to a penstock forty-two feet in length. A ditch, about 1,500 ft. long, conveyed the water from a six-foot dam on Yellow Jacket Creek. Anchor ice that formed on very cold nights in the creek would sometimes, when the temperature rose suddenly, break loose and in the form of a fine, slushy material, before we knew it, fill the penstock full of ice, stopping the water wheel. It took two days to dig it out. The ditch on the hillside would often break, causing many shutdowns.

During the winter of '93, logs were cut and two-inch plank was sawed from them for a flume. To cut a groove in the edges of the planks, an old broken saw blade was cut to about seven inches in diameter. Teeth were filed in it. It was wedged at a slight angle on a shaft, thus enabling a groove three-eighths of an inch wide and of the same depth to be cut in the edge of the two-inch plank. Small tongues were sawed out for the grooves. The primative tongue-and-groove joint thus made was practically leak-proof.

The following May the mill was shut down. Part of the mine force was brought down to put in the new flume. The weather was dry and windy. The roof of the mill had been in place twenty-seven years, and the shakes that covered it had become worn and frayed. When it was seen that the flume would be completed within the day, the mill men put on new shoes and dies. It had been customary to fasten on the shoes with wedges made from hard wood obtained from plug-tobacco boxes. The shavings and refuse from making the wedges were burnt in a large heating stove in the mill, and under the prevailing conditions of wind the sparks resulting set fire to the shakes. The fire spread the length of the roof almost instantly. The mill was lost. The flume at the time lacked two plank lengths of completion. At the suggestion of Tom Kelley, boss carpenter, a force of men was sent to throw in the two plank lengths, weight them down with rocks and place side boards. The water was turned in and the flume and penstock were saved.

Changes in Power Plant and Construction of New Mill

The dam was deepened to about twelve feet and a plank apron twenty-four feet wide on a fifteen degree pitch into the water was constructed. The crest of the apron was six inches lower than the rest of the dam. This spillway was effective in carrying off the anchor ice.

The flume was four feet high and six feet wide and covered with loose one-inch boards. It received the water from the bottom of the dam. A sawmill was put up, and during the summer a half million feet of lumber were cut for a new mill. On Oct. 4, 1894, the plans for the new mill were received. The building was 75 x 150 ft. It was double sheathed with building paper between the boards and battens outside. Twenty new stamps and the ten old ones that went through the fire were used. Some of the stems of the old battery were badly bent, but our mechanic, George Ferguson, made a contrivance and then heated and straightened them in the blacksmith shop. The freight route was changed to Pedrock, on the Butte branch of the O. S. L. R.R., thence by wagon road to Salmon City and Leesburg, over the first divide. This cut the packing over the trail to a distance of about thirty-odd miles. Contracts were made with the packers at 2½c. per lb. They agreed to see the job through, even if it took all of the winter.

The water supply for the batteries was obtained from a spring about 2,000 ft. up the gulch on the road to the mine. It was brought to the mill in a 4 x 4 in. wooden box made of 1-in. lumber. The box was covered with earth, thus keeping the temperature of the water in the battery and upon the plates about 56 to 58 deg. This water was used for hydraulicking soil and gravel on the hillside at the mill site. Gold being found in the excavated material, sluice boxes and riffles were put in, and some gold was recovered. Snows came the last of November. The trail became icy. Occasionally a mule was lost. Hay for the mules had to be packed in. Feeling that trouble was brewing, we went outside and purchased a pack train of thirty mules, hiring the former owner to handle it. Along in December, all of the packers came to the office and struck for more pay. Asked if their contract required them to pack all of the freight in at the agreed price, even if it took all winter, they replied, "Yes, but we can't do it." "Is this your last word?" we asked. "Yes," was the reply. Our answer was that the company would pack the freight if the contract was broken. We had been constructing additional road, so that the packing distance was then not over twenty-two miles. The packers stuck and delivered the freight.

Record Made in Constructing Mill

The twenty new stamps began dropping on ore in 110 days from the time the plans were received, a record when the transportation conditions are taken into consideration. The work was expedited, as the bill of lading showed numbers and exact contents of each box. Box contents were checked at the factory by three separate checkers. We never found a bolt or nut missing, and it often became necessary to send a man and a mule out on the trail until he found a certain numbered box which was needed. The machinery was purchased from Fraser & Chalmers.

The Leffel water wheel contained an important hardwood bearing. During the winter of '93-'94 sand cut out the bearing. No hard wood was available nearer than Salt Lake, the round trip thereto requiring over two weeks. Some of the boys recalled that during the previous autumn, while hunting on the Middlefork, they had seen some mountain mahogany, which at that altitude often grows a knurly knob just at the grass roots. Two of the men sent out on snowshoes came back on the second day with several of the knurly knobs. Twenty-four hours later the mill was running on a better bearing than the original white-oak bearing that had been replaced.

The men were charged $1 per day for board. When the company took over the property board cost 98c. per day per man. By judicious buying and discounting all bills the cost was cut to 68c. per day. No complaints were made. In fact the table had the best reputation in Idaho. Fat beef cattle were driven in as late as possible and killed at the mill. The dressed quarters were hung in a cool, dry place, and kept all winter.

During the '93-'94 winter there were twenty-four cases of pneumonia in the camp. The nearest physician was sixty miles away and had to make the trip on snowshoes. A man was put with each case as a nurse. Our medicines were limited to quinine, cathartic pills, and nitric acid from the assay office. Hot corn-meal poultices were used, being changed in the early stages of

the pneumonia every twenty minutes. Only one case was lost, and this was due to the patient's disobeying orders.

The sawmill was on the hillside on the tramway level. All lagging was cut ready for use from slabs and poor lumber and sent up on hooks on the tram to the mine. This situation placed the sawmill about 75 ft. vertically above the penstock and a similar distance to one side. A quarter-turn belt from the vertical waterwheel shaft drove a pulley on a horizontal shaft. A grooved cast-iron pulley lined with rubber was placed on this shaft and a pair of similarly lined pulleys at the turning point. On the saw shaft was another pulley of the same kind. Power was transmitted by a ⅝-in. wire cable. A traveling pulley was placed on the power cable at the saw level and a weighted box took up the slack of the cable.

Pitch as a Substitute for Rubber Lining

During the winter of '94-'95, when lumber was still required, the hard rubber linings cut out. New ones could be obtained only from Chicago. Men on snow-shoes, with axes and sacks, were sent into the hills to cut pine pitch wherever found. The pitch was placed in a five-gallon can, and the can placed in a larger kettle filled with water. By applying heat the pitch was melted. A single strand from an old manila rope was wound into the groove of the wheel, and, as the wheel was turned slowly, the hot pitch was poured in. This gave even better results than the rubber lining, and only two days were lost by the delay.

The years covering the experiences here detailed were during the troublous period in the Cœur d'Alenes. Many miners drifted into Yellow Jacket from there. Although they had a union affiliated with the Western Federation of Miners, we had no trouble and always had sufficient workers.

The ore was free milling and averaged just under $10 per ton. The original ten-stamp battery that Haggin put in was made by the Union Iron Works, of San Francisco. The battery was a double discharge one, but only one side was used. An extra set of silver-plated copper plates was put in, and both discharges of the battery were used, better results in tonnage and extraction being obtained. In the new mill the plate surface was doubled by placing a full-sized table below the apron plates, a sharp drop being left between the two sets of plates. Small pieces of copper plates were cut and put in the launders clear out to the tailings pond. These were cleaned up once a month, with satisfactory results. With the new mill the tailings assays were cut to between 40 and 50c. per ton.

Downward Extension of Vein Lost

The vein was first discovered and worked on the top of a ridge. It was high grade and was stoped 50 ft. wide, 90 ft. deep and about 200 ft. along its course. It was cut by a fault and picked up lower down upon the ridge on rather flat ground. Here the vein material was a hard, white quartz 48 ft. in width. Much of the intervening ground from grass roots down to between 50 and 60 ft. in depth was fine, erosional material containing bunches of white quartz. All of this milled from $7 to $10 per ton. The ground was heavy. Square sets were used, the red fir posts being from 12 to 15 in. in diameter.

A crosscut about 200 ft. vertically below the lowest workings was begun prior to the change of management. I understand that considerable crosscutting has since been done to the south in endeavoring to find the vein, but the work was unsuccessful. I have often wondered if a reverse fault had not thrown the vein north of the original discovery. The country rock is porphyry and is broken. The new management, succeeding our control, contrary to competent advice, doubled the mill, water power and tramway. It is known that $72,000 was spent and $68,000 won. The mine has been idle since that time.

Gold, Bauxite, and Quicksilver in Dutch Guiana

The production of gold in Dutch Guiana shows a steady decline, according to Consular Agent James S Lawton in *Commerce Reports*. No new discoveries were made in 1919, although there has been a revival of interest in the old Sara Creek mining district, principally by small lessees. Total gold production for the year 1919 was valued at $357,027, and of this $144,083 worth was produced by one company, working entirely by hand, in the Marowyne district. On this same river, an American company continued prospecting with a view toward dredging. Results are reported as having been satisfactory.

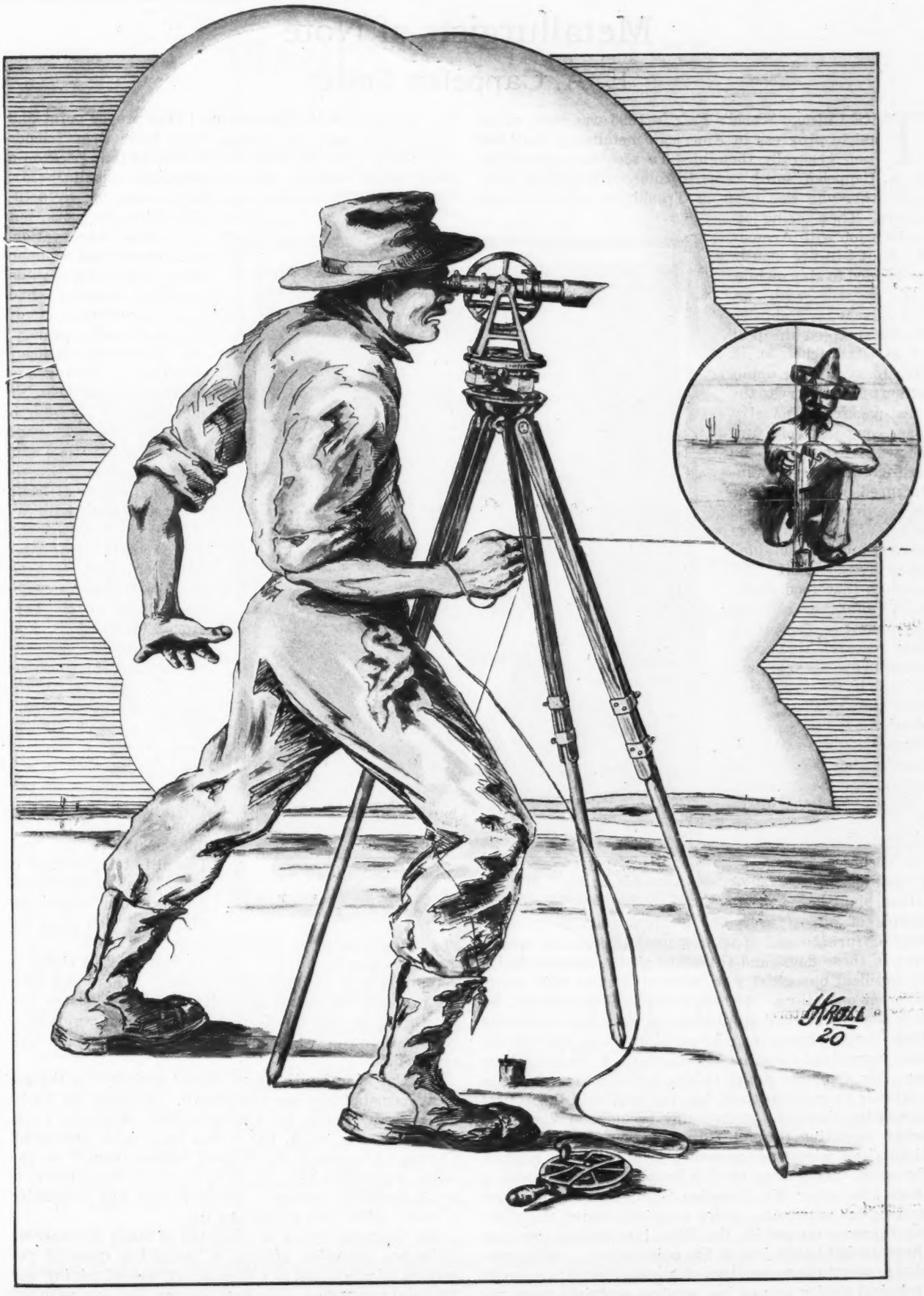
A law now provides conditions under which exploitation of the bauxite deposits of the colony may be undertaken. Some of the chief features of this ruling are: Concession may be granted for any length of time not exceeding fifty years. No company or individual may hold at one time more than 125,000 hectares (1 hectare = 2.47 acres). The taxes on the bauxite land are as follows: For the first year, 10c. Dutch currency per hectare (1.6c. American currency per acre); for the second year, 20c. per hectare (3.2c. per acre); for the third year, 50c. per hectare (8c. per acre); for the fourth year, 75c. per hectare (12.1c. per acre); for the following years the tax is 1 guilder per hectare (16.2c. per acre).

Every concession holder is bound to mine yearly during the five years, commencing from the date of the concession, twenty tons on each 100 hectares or part thereof held. After the fifth year the minimum mined shall be ten tons per 100 hectares, and on each ton mined a royalty of 25c., Dutch currency (10c. American currency), shall be paid to the government. Corporations holding concessions now know under what conditions they must work, and preparation to mine and export bauxite are going forward rapidly.

Prospecting has continued, in a small way, for quicksilver ores, float of which has been found in a number of places near the Marowyne River, and it is reported that quicksilver has been found in place on one concession. The government, in connection with a Dutch company, continued to explore large areas of ground said to contain high-grade iron-ore deposits.

Spectroscopic Analysis of Gold

Nine standard samples of gold alloyed with silver, copper, and iron have been examined spectroscopically to establish a method for making quantitative analyses of mint gold from spark spectra, according to the Bureau of Standards, Washington. As a result of this work, it appears that the common impurities of gold can be estimated in the range of 0.0001 per cent to 1 or more per cent, with a probable error of not greater than a few hundredths of 1 per cent.



THE PLANE SURVEYOR IN MEXICO

Metallurgists of Note

E. A. Cappelen Smith

THE Chicago World's Fair in 1893 was more of an aid to progress in American metallurgy than has been generally thought. To see that exposition, E. A. Cappelen Smith came to this country from Norway, where he was born, at Trondhjem, twenty years before. Then, being offered a job with Armour & Co. at $40 per month, he decided to stay awhile, and is still with us. When Mr. Cappelen Smith accepted the post of assistant chemist in the stockyards the application of chemistry to the meat-packing industry was comparatively unknown. Practically no byproducts were manufactured, and he was one of the first to show that a lot of things besides meat could be obtained from livestock. He still believes that food chemistry offers even more opportunities for profitable research than does metallurgy. A year and a half later, a position with the old Blue Island Works of the Chicago Copper Refining Co. offered almost double the salary, so was accepted. This was really more in line with the training which he had received at the Technical College of Trondhjem. The Blue Island plant had a small sample of almost every kind of furnace and apparatus used in treating copper ores in those days, and therefore gave Cappelen Smith an excellent opportunity to become familiar with many different operations. Although employed as chemist, he took a great interest in picking up practical knowledge from the workmen, and he considers this one of the most important essentials to success. It is not necessary, Mr. Cappelen Smith thinks, actually to work up as a laborer from the bottom, but one with only theoretical knowledge should unquestionably become familiar with actual operating through close observance and friendly discussions with the foremen and others who conduct the work. The value of this knowledge was proved a short time after Mr. Cappelen Smith had further progressed to Anaconda. After hanging around the refining furnaces for awhile, Pat Shea, the foreman, one day threw up his hands just at the point when a charge was about ready to be poured and intimated that with so much technical ability around his services certainly were not required. To Pat's amazement Mr. Cappelen Smith took the furnace, carried the refining to the proper point and successfully cast the charge; they were firm friends thereafter. Pat said that he had played that trick on a good many others, with unfortunate results. Mr. Cappelen Smith's ability had been gained, not by actually doing the work, but by close observation, questioning and common sense. Leaving Anaconda in 1901, where he had been superintendent of the electrolytic refinery, the Baltimore Copper Smelting & Rolling Co. proved a fertile field for metallurgical research during the next nine years. In this time Mr. Cappelen Smith develcped the process of basic converting and, with W. H. Peirce, patented the Peirce-Smith horizontal basic converter. He was also the first to use magnesite brick in reverberatory construction and to blow air into the molten bath of copper-refining furnaces. "We burned up miles of pipe," says Mr. Cappelen Smith, "and finally I tried a water-jacketed pipe." "Jim, I want you to put this pipe in that bath of copper," he told the furnace operator, "but first I want to tell you what it is." Its construction having been explained, Jim said, "You want me to put that water pipe in that copper?" "Yes." "Where are *you* going to stand?" "Right here." "All right, if you are willing to stand there, I will." There and then the problem was solved, and with a leaky jacket too, for the thread on one of the nipples had given way and a stream of water was spouting out when the pipe was removed.

E. A. CAPPELEN SMITH

Mr. Cappelen Smith's more recent activities in the art of hydrometallurgy are well known. Devising the leaching process used at the Chuquicamata deposit in Chile was all pioneer work, but it has been most successful. Through his genius the largest copper deposit in the world, heretofore thought of no economic importance, is being profitably treated. The first unit has a capacity of over 15,000 tons of ore per day.

Mr. Cappelen Smith is a member of many engineering clubs and societies, acts in a consulting capacity for several interests and is a director of several mining and financial companies. His headquarters are now with the Guggenheim Bros., in New York.

HANDY KNOWLEDGE

Repairing Lips and Bottoms of Steel Ladles

Owing to the smelting process followed at the Nickelton, Ont., plant of the British American Nickel Corporation, the slag obtained sometimes runs high in matte, the action of which is destructive to steel ladles, tending to corrode the steel at the point of contact and injure the kettle beyond further practical usefulness. The company has recently been reclaiming such ladles by means of thermit welding. In making repairs, pieces of steel were forged and welded into the ladle by an in-between casting of thermit rather than by completely filling the burnt or holed area by a thermit steel casting. By this method excessive strains were minimized.

FIG. 1. LADLE WITH THREE BOTTOM PATCHES IN PLACE BEFORE APPLYING WAX COLLARS TO PATCHES

In repairing a ladle with holes in the bottom, three patches were made owing to the irregularity of the holes and the greater ease of making three patches than one irregular patch. In lining up the patches, approximately one inch was provided at the edges for the entrance later of thermit steel. These patches were surrounded by a yellow wax pattern, and the usual thermit welding practice then followed. Riser patterns were used both inside and outside, the ladle resting on its side, one coming off at the high point and two others placed about half-way down on the wax. These latter two served to take care of the shrinkage of metal.

In making welds on the sides of kettles care must be taken not to put too much metal in the "collar" of the weld, as otherwise there would be a tendency to interfere with the clearing or "skulling" of the ladle. In applying the wax collar the wax should be from $\frac{1}{8}$ to $\frac{3}{16}$ in. fuller than the finished shape, to allow for shrinkage during contraction.

In forging a lip patch, the blacksmiths followed the outline of the cut ladle, cutting and shaping the patch to provide a peripheral space of about one inch width. It was no small job to shape the patch, and it is believed

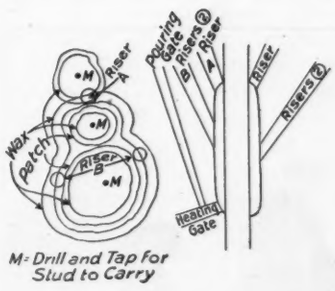


FIG. 2. PLAN AND SECTION, WITH PATCHES AND RISERS

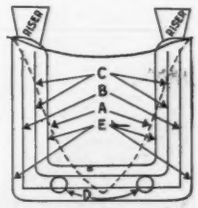


FIG. 3. SKETCH SHOWING A LIP PATCH

that in future repairs of this kind time can be saved by cutting away the kettle to a square shape, as shown by Fig. 3. The lower portion will not then lend itself readily to melting down during the pre-heating operation. It may also be preferable to cast the lips of steel, rather than to forge them.

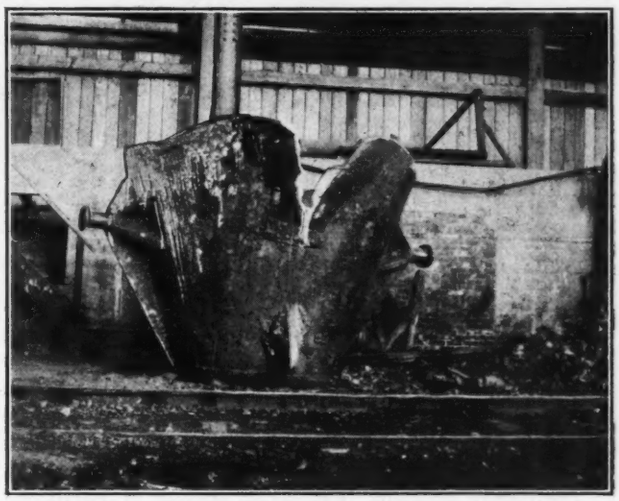


FIG. 4. LADLE SHOWING EXTENT TO WHICH LIP IS CUT OR CORRODED AWAY BY STREAM OF HOT MATTE

Preventing Accidents From Overhead Traveling Cranes

In the Nov. 22 and 29 issues of the *National Safety News* two methods for preventing accidents from overhead traveling cranes are shown. The method ordinarily used is a street-car warning gong placed on the floor of the crane cab and operated by the craneman as occasion requires. Both of the suggested methods are better than the one described. In one case the "crane hitcher" is required to walk a few yards ahead of every moving crane load and to clear the way of workmen. In the other, an electrically operated horn or an electrically operated gong is placed as near to the moving load as possible. The best position is immediately above the crane hook, and the device is operated by a push button in the cab.

Drilling Frozen Chunks With a Steam Jet

Written for *Engineering and Mining Journal*

On the Mesabi iron range of Minnesota the work of stripping or removing of overburden at the open-pit mines is carried on during the winter months. Some stripping is done in the summer also, but as this season is the period for shipping the ore by Lake boats,

APPLICATION OF STEAM JET DRILLING FROZEN CHUNKS IN IRON MINING

the steam shovels are employed principally in loading iron ore into cars for shipment to the docks.

In ordinary practice the ground in front of the shovel is loosened by means of blasting, and in this procedure holes are first drilled, either by means of jumper drills or steam jets, loaded with dynamite, and then fired. It frequently happens that large masses of earth are overcast by the shovel and occupy positions above the shovel cut, where they are not only a source of danger, but are of such size that they cannot be conveniently handled by the steam-shovel dipper. In this event the chunks are drilled and then blasted.

The accompanying illustration shows a large frozen chunk being drilled by means of a steam jet. A length of steel pipe is sharpened at one end and the other is placed in a steam hose. Steam is obtained from the steam-shovel boiler, and in some instances several lines of hose are supplied. When the steam is turned on, the operator forces the point of the drill into the frozen ground, turning it as he does so. A steel plate, which may be seen in the cut, is placed on the pipe in such a manner as to protect the operator from the steam or pieces of earth that may be blown out of the drill.

Sampling Hot Gases

Written for *Engineering and Mining Journal*

In sampling the gas in a roasting or reverberatory furnace, or a converter, considerable care must be taken not to have misleading results. One thing which must be prevented is any reaction between the sample tube and the gas. An ordinary iron pipe cannot be used in a hot furnace, for example, even though the temperature is below the melting point of iron, for any oxygen in the gas may react with the iron, and then the analysis will erroneously show absence of oxygen. The proportions of the other gases present will of course also be incorrectly reported. The sample pipe should be thoroughly water-cooled, or, better, a fused silica tube should be used. The rubber tubing must be carefully tested for leaks and all joints wired and shellacked. Atmospheric air must be completely expelled before taking the sample.

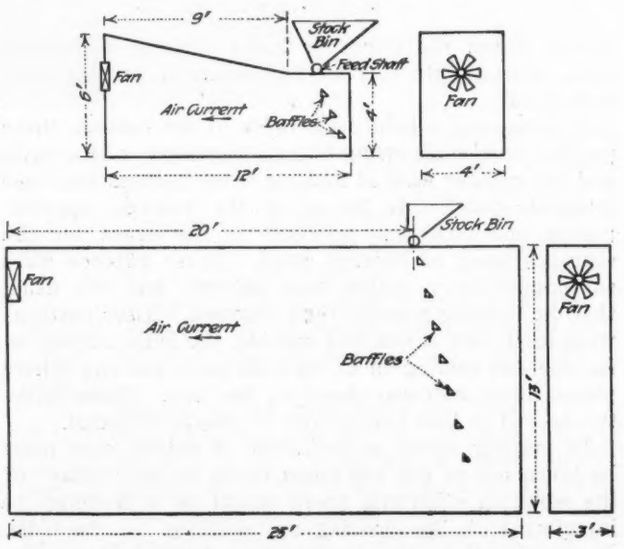
Another point not to be overlooked, especially when taking samples in flues, is that the gas stream is not homogeneous. Near the wall free oxygen will often be found, whereas at the center of the flue the gas composition may be entirely different. Also, the gas is usually changing from minute to minute, and to get a true average a large number of samples must be intelligently taken.

Air Classification in Ore Dressing

Written for *Engineering and Mining Journal*

Air classification is used in most graphite refining plants, and forms an important step in the refining process. The accompanying cut shows sketches of air classifiers usually made at the plant. So far as is known no experimental work has been done by the large majority of operators with a view to determining the most efficient proportions and shape for this device.

In principle, an air suction created by a fan at the back of each chamber is applied to a falling stream of graphite ore or concentrate. The heavier material, which is made up of quartz grains with attached graphite, is practically unaffected by the air suction, and falls into a hopper furthest from the fan. The lightest particles are drawn closest to the fan, which draws the finest dust into the atmosphere. When this



TWO TYPES OF AIR CLASSIFIERS

apparatus is used on crude concentrates, the middlings —which include the heaviest flake—form No. 1 flake stock, going to the No. 1 buhr mills, whereas the finer material closest to the fan is screened to remove as much finished No. 1 flake as possible.

By The Way

Greek Meets Greek

The War Minerals Relief Commission has been advised of a case of profiteering in commissions. An award was made recently in the neighborhood of $40,000 on a certain claim. Despite the frequent intimation, on the part of members of the commission, that claims could be handled without the intervention of lawyers, the claimant in this instance employed an attorney, to whom a power of attorney was given. This specified that he was to collect any award made on the claim. He made the collection, took one-half of the amount for his fee and deducted a liberal expense account from the remainder before forwarding the claimant his share.

An Unsuitable Fit

"W'en Tom Pengilley firs' h'arrived from Camborne, m'son," said Cap'n Dick, "'e went to work daown to tha h'Ophir mine, w'ere 'is cousin, Sam Treloar, wuz shifter. One day tha chap 'oo druv tha mule on tha ten 'underd main 'aulage laid h'off without reportin', so Sam sez, 'Gos' 'long do, Tommy, an 'itch up they gert grey mule an' drive un for tha shif'. Naow, Tom 'ad never put 'arness h'on a mule or a 'orse in 'is 'ole bloody life, but not wishin' to h'appear h'ignorant 'e gaws forth, not sayin' a word, to carry h'out tha boss's h'orders. In baout a hour, w'en no cars 'ad come to tha station, Sam went in to see w'ot's tha matter, an', dam-me, 'e meets Tom commin' h'out tha level with tha mule's collar in 'is 'and. 'Wot's tha matter 'ere naow, Tommy? 'Are'nt thee put 'arness to that mule yet.' sez Sam. 'So I 'ave,' sez Tom. 'I put un h'on right away; h'all 'cept this ere gert leather gasket w'ich 'pears to me to be too bloody small to pass h'over tha gert h'ears of un.'"

Africa for the Africans

Permission to sell 100,000 shares of stock at par "to colored people only" has been asked of the Arizona State Corporation Commission by the Comobabi Consolidated Mines Co. The promoters and all stockholders are said to be negroes. The company's property is in the Comobabi district of Pima County. This is bad business. In the promotion end of the mining game all questions as to creed and color should be forgotten. The one thing needful is to get rid of the stock before the condition of the "mine" becomes known to the public. Then again, what if other promoters should retaliate and refuse to let colored people in on the ground floor of some of their matchless propositions. Besides, discrimination of the sort mentioned is likely to stir up racial strife, and Arizona has been happily free from this so far. Imagine the envy that will be aroused if Comobabi comes through a winner. The Corporation Commission will do well to consider these things carefully before coming to a decision.

Annual Assessment Abolishment

Things were quiet in the old mining town. There was the sting of winter in the air. A snarl of the wind and a rattle of gravel against the worn front of the little hotel gave place to a moment of silence. The faint tolling of a bell was heard. Old Birdseye Porphyry stirred uneasily in his worn leather chair and said to Phenocryst Jones, his close-by neighbor: "What's that?" Phenocryst shifted his tobacco and said: "Haven't you heard? It's old Ground Mass Murphy. Died of starvation." "Died of starvation! How's that possible?" said Birdseye Porphyry. Phenocryst stretched himself and hunched back into his chair, saying: "You are very much behind the times, Birdseye. Haven't you heard what those law makers have done over there in Washington? No! Well they've abolished the mining assessment law again. This makes the third year of the annual abolishment of assessment. Old Ground Mass used to pick up a few dollars every year by doing the assessment on the ten claims of the Wild Gallop Mining Co. up in Depravity Gulch, on the other side of Pick Handle flat. He did the work for $40 a claim, and laid in enough grub to last him over the winter. Now those 'cheap skates' have found a better way. They just write to their Representatives and Senators and say, 'Have a law passed cutting out the assessment work. We're up against it again and can't pay our bills, and we must have the claims.' Of course those 'birds down at Washington' want to be accommodating, and they just press a button and summon their secretaries and direct them to 'shoot the law through.' But they did it this time. Poor old Ground Mass got thinner and thinner. He had a desperate struggle each winter. Where have you been? Haven't you seen him getting gaunter and leaner? Well, he borrowed from all of us; but, you know, he had pride. When he heard that the assessment was to be abolished again he just kind of disappeared, and Magmatic Segregation went over to his cabin yesterday and found him all cashed in. It beats all, don't it? Well, of course, those fellows down at Washington don't know how they are interfering with the living of fellows like us. I have half a mind to write to the *Engineering and Mining Journal* and ask them to call off these abolishments and get things back to normal, or this old town is going right to smash. We've had the gilt-edge taken off of two winters, and now this is the third, and it's getting almost personal."

"Have you read the last *Journal?*" said Birdseye, as he rubbed one shoe over the toe of the other and pressed his tobacco down into his pipe. "No, by heck, I haven't," said Phenocryst. "What does it say?" "Well!" said Birdseye, "it says that the Senate has put the 'kibosh' on the original bill by changing it to six months' grace." Phenocryst moved closer and waving a finger at Birdseye he said, "How in heck is that going to help Ground Mass?"

No Gold for Santa

Those in banking circles will doubtless be as much surprised at the recent request of the Treasurer of the United States that they should not distribute gold coins for holiday purposes as they will be relieved to have a further excuse for refusing to pass out gold through the paying teller's window. Their surprise will be but natural with the recent utterance of their Bankers' Association committee still in their recollection that "no national emergency exists calling for special treatment of the gold-mining industry." This admonition from Treasurer Burke must seem as needless to them as the passage of the McFadden gold bonus bill would be. But they will heed it and hang on to their gold. Indeed, their tenacious grasp makes one suspect that they value gold beyond its intrinsic worth.

CONSULTATION

Manganese Bronze and the Dry Cell

"Will you be kind enough to give me an answer to the following questions?

"What is manganese bronze, how made and its uses?

"Where can I get information as to the manufacture of dry-cell batteries?

"Are carbonated gases made from manganese dioxide and by whom?"

Manganese bronze is an alloy designed to develop a maximum resistance to corrosion by ordinary mine and sea water and at the same time have strength and toughness, with light weight similar to a mild steel. These essential characteristics are secured by many alloy combinations, actual or proposed, the most popular of which is manganese bronze. This is a brass to which have been added small quantities of aluminum, iron, and manganese to strengthen and render the alloy dense and close grained. An important consideration in the quality of the alloy produced is the amount of lead present, as it is a deleterious impurity and should be kept below 0.03 per cent. The composition of manganese bronze as given by W. C. Phalen is ordinarily about as follows:

	Per cent
Copper	57.00-59.00
Zinc	38.00-40.00
Iron, manganese, aluminum and tin	.25- 1.00
Lead	.10- .50

From which it can be seen that a relatively small proportion of manganese enters into the composition of this bronze. The amount of manganese used in the bronze, according to J. L. Jones, of the Westinghouse Electric & Manufacturing Co., should not exceed 0.05 per cent, and many of the best manganese bronzes show on analysis only a trace of manganese. However, some manganese bronze of good quality has been made containing about 4 per cent manganese, particularly the grades first produced. As a source of manganese consumption the manufacture of the alloy is relatively unimportant; in fact, its name is rather misleading in point of manganese content.

Manganese bronze is widely used, particularly in marine construction or in machinery where corrosion is counteracted (mining machinery), and it has gained in popularity because of its advantageous physical properties. Hence its use in propeller blades, where resistance to the action of sea water, strength, and toughness are highly essential.

The object of the manganese is to serve as a carrier of the iron necessary to insure the proper strength, and it serves but one purpose, which is to introduce the iron, for without the presence of manganese the iron would not alloy with the copper. Ferromanganese may be used as the medium for introducing the manganese.

The alloy can be made either from a pure brass to which aluminum, iron, manganese, and tin is added, or it can be made from low-grade scrap material, skimmings from the brass foundry, zinc, iron recovered from galvanizing plants, aluminum turnings, and other byproducts. It is necessary, however, to use a reverberatory or other furnace in which it is possible to accumulate a bath of considerable volume, so that refining is facilitated. Details of the operation will be found in a paper by P. E. McKinney published in the *Transactions* of the American Institute of Mining and Metallurgical Engineers, Vol. LX (1919) pages 374-385.

Bulletin 173 of the U. S. Bureau of Mines, entitled "Manganese Uses, Preparation, Mining Costs, and the Production of Ferro-Alloys," is a valuable publication on the subject, and contains several pages upon the manufacture and operation of the dry cell. The dry cell consists essentially of a zinc container holding a central carbon electrode and packed with a chemical depolarizing mixture.

The use of manganese in the dry cell is confined to the chemical mixture or "mix," which is placed around the centrally located carbon electrode about one inch from the top of the container and is a depolarizing mass. It is essentially a mixture of ground carbon (calcined petroleum coke and graphite), manganese-dioxide ore, and the electrolyte (ammonium chloride). The manganese dioxide serves as a depolarizing agent and oxidizes the hydrogen evolved during the operation of the cell which would ordinarily polarize the chemical reaction.

The rigorous physical and chemical characteristics required of manganese are suitable for use in dry cells and have been enumerated in an article in the consultation department in the issue of Aug. 14, 1920, to which reference should be had.

The *Engineering and Mining Journal* does not know of any attempt to produce carbonated gases from manganese ore, although no doubt it can be obtained from the carbonate. Limestone is much cheaper for the purpose.

Oil-Shale Information

"Can you advise me where I can look for authoritative information on the method now in use for the distillation of oil shales?"

A publication of the Bureau of Mines of the State of Colorado, entitled "The Oil Shales of Northwestern Colorado" (Bulletin No. 8), which can be obtained from the department at Denver, gives a valuable bibliography on the subject of oil shales and contains an excellent résumé of the oil-shale industry in this country up to the middle of last year, and, although written with particular reference to Colorado's deposits of oil shale, the text applies equally well to shale formations of other states.

The U. S. Bureau of Mines at Washington, D. C., has published from time to time brief papers on the oil-shale industry in this country, and it might be a good plan to communicate with the Bureau in order to obtain a set of these recent special investigation papers.

The *Engineering and Mining Journal* has also published articles upon the subject, particularly during the last year, and reference should be had to the files of the publication.

THE PETROLEUM INDUSTRY

The Burkburnett Field—A Lesson to Oil Men

Operations Conducted in Texas District Represent Needless Extravagance and Emphasize the Viciousness of Stock Schemes Promoted by Adventurers—A Plea for More Careful and Systematic Exploitation*

BY R. E. COLLOM
Petroleum Technologist, Bureau of Mines

THE development of the Burkburnett oil district, Wichita County, Tex., took place in three stages over a period of eight years. In June, 1912, a well was completed on the Schmoker farm, about three miles southwest of the town of Burkburnett. This well was drilled to a depth of 1,847 ft. by the Corsicana Petroleum Co. Its initial production was 75 bbl. of oil per day. This was the beginning of what is now known as the Old Burkburnett pool.

During the two years following the discovery, considerable drilling was done in the pool. Adverse marketing conditions caused a slump in drilling operations during 1915, but toward the end of that year there was an improvement, and active drilling, both in proved and wildcat areas, was resumed. The total production of 1916 was a little more than 2,000,000 bbl.

During 1917 and 1918 the Old Burkburnett pool reached the height of its development. The productive limits of the field were determined by the drilling of numerous "dry" holes on the edges of the pool. A shallow pool, of small producers, lying in the south central part of the field, was also developed. Some of the wells in Old Burkburnett pool showed high initial productions. Two wells on the Serrien farm came in at an initial production of 2,500 bbl. daily. A number of wells were reported as having initial production of 300 to 750 bbl.

EARLY DEVELOPMENT OF FIELD WITHOUT SPECULATION

These productions are as high as those which caused the country-wide excitement, comparable only to the old-time rushes for gold, in the later drilling of Burkburnett Townsite and Northwest Extension pools. Old Burkburnett was never known by the speculating public. Apparently, during the development of this pool the psychological moment for speculation had not arrived. Then, too, the properties were in large tracts, owned and operated by experienced oil companies. Drilling was carried on in a businesslike manner, and the fortunes of exploration, whether gushers or "dusters," were accepted as part of the day's work. There was little opportunity for the stockjobber to get a foothold in the development of Old Burkburnett.

The development at Sunshine Hill, about six months before the discovery of Burkburnett Townsite pool, gave a preliminary test of the public's speculative temper. A forty-six-acre tract at Sunshine Hill was plotted into lots twenty feet square, and these were sold at $40 each.

The first well drilled on the track struck a good-looking oil sand at a depth of 580 ft. In a short time the lots were covered with derricks and drilling machines. By the end of April, 1918, there were seventy-five producing wells in the pool, and in many cases two wells were drilled on a 20-ft. lot. In a little over two years 245 wells were drilled on a tract of about 500 proved acres. The average production, in June, 1920, was two barrels per well daily.

Among the prospectors seeking oil in north Texas was a group of individuals known as the Fowler Oil Co., who pooled $12,000 to drill a test well on the northern edge of the townsite of Burkburnett. This well was known as Fowler No. 1. The nearest producing wells were in Old Burkburnett pool, three miles to the southwest. A dry hole had been drilled one-fourth mile north of the well, and the Roswell Oil Co. drilled a 2,450-ft. hole some distance southeast of the well without getting oil. During the last week of July, 1918, the drill in Fowler No. 1 entered an oil sand at 1,718 ft. The well came in flowing 2,200 bbl. of oil per day.

This was a big gusher for Wichita County. It was drilled near land, such as the Burkburnett Townsite, which had not been acquired by oil operators. The Fowler well started a town-lot boom in Burkburnett. Drilling for oil became anybody's game, and town lots were sold for $1,000 each.

Three weeks after the Fowler well came in there were fifty-six strings of tools running in Burkburnett Townsite. The larger operating companies were doing some development work but not crowding the holes like the town-lot speculators.

OIL GAMBLING BECOMES RIFE IN BURKBURNETT

Speculators and lease brokers flocked into Burkburnett. Leases were divided into acre and half-acre tracts—even drilling sites—and became the physical basis for the organization of stock companies. Burkburnett and near-by towns were crowded with people, a small proportion of whom were oil operators. The gambling spirit ran high. Adventurers, tender from the cities of the east, as yet to see their first oil well, milled about in the hotel lobbies in search of oil. They overflowed into the streets. Barrels were set on end and used, in lieu of desks, for transacting "oil" business. The rotary table became the "wheel," and the "numbers" to be played were shown on the checkerboard map of the townsite. Each successive gusher was a signal that some new number had won.

Drilling activity in Burkburnett Townsite continued until well into the spring of 1919, at which time the

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pool had lost most of its glamour, owing to a rapid decline in production. About the middle of April, 1919, the Ryan Petroleum Co., wildcatting 3½ miles northwest of Burkburnett Townsite, brought in a gusher in the northeast quarter of Block 84 on the R. M. Waggoner farm. This well started producing at the rate of 2,000 bbl. per day, and was the beginner of an intensified drilling campaign in the Northwest Extension or Waggoner pool.

By the end of June, 1919, the Northwest Extension was producing 16,000 bbl. of oil daily. It was estimated that if all producing wells in Burkburnett district could be connected to gathering lines, the daily production would show in excess of 110,000 bbl.

There were no town lots in the Northwest Extension to facilitate the division of the pool into small holdings. However, many properties were divided into tracts of five acres, two acres, or less. It was a common custom to drill four wells on a five-acre tract.

When intensive drilling operations first started in the Northwest Extension, one of the larger pipe-line companies warned operators that unless drilling activities were retarded production would soon exceed storage and transportation facilities. This warning was not seriously heeded. Much oil was wasted because stock promotion companies insisted upon immediate completion of test wells, regardless of whether or not there was adequate storage to take care of the oil. Oil, as a commodity, they did not desire. A big flow of oil, regardless of what was done with it after it gushed from the well, boomed the value of the stock. In many cases, however, these values were transitory and the final holders of stocks learned that their "play" could never be interpreted in terms of investment or dividends. Many companies had tracts in favorable areas, but were delayed in getting a well drilled to the sand. When the well was finally drilled it was found that neighboring wells had literally taken the oil away from under their properties. As a result of these conditions, flow tanks were full and running over at a number of wells. Wells were permitted to flow because it was claimed that a well, if once shut in, would not produce as strongly again. When storage failed the oil was wasted into the ground or turned into the Red River.

Overproduction, lack of storage, railroad embargoes, and continuous overdrilling all contributed to the congested conditions in Burkburnett. In an attempt to relieve this congestion, a producers' committee was selected to go to Austin to request the Railroad Commission of Texas to issue orders to close down flowing wells, stop swabbing and suspend drilling for a period of thirty days. It was hoped that such an order would give pipe lines a chance to make storage space and, by cessation of drilling activities, the railroads could clear the congestion in their yards. A five-day shutdown was finally attempted. This met with considerable opposition, and many concerns allowed their wells to continue to flow and waste oil in spite of the necessity for conservation.

Productive Limits of Field Reached Early in 1920

In October, 1919, development of the General, or River, pool in the bed of the Red River northwest of the Northwest Extension and, later, the George pool, on the westerly edge of the Northwest Extension, helped to maintain the average daily production per well for the district. Except for the contributions from the George and General pools, the productive limits of the Townsite and Northwest Extension pools had been determined early in the spring of 1920.

Both the Northwest Extension and Townsite pools are practically surrounded by dry holes. Owing to the dispute between Oklahoma and Texas, drilling in the Red River on the northern boundary of Northwest Extension was somewhat curtailed. There is not much probability, however, that the productive area of Northwest Extension will be greatly increased beyond its present northerly limits.

As a result of speculative operations in the Burkburnett Townsite pool, 885 wells were drilled in a proved area of 1,265 acres. This is an average of 1.4 acres per well. The drilling in the Townsite proper averaged slightly less than one acre per well. It is probable that a normal development program for this pool, considering depths of holes, would be one well for every five acres. In other words, 250 wells, or one-third of the number actually drilled, should have been suffcient to economically drain the pool. Up to the end of June, 1920, about 13,000,000 bbl. of oil had been credited to Burkburnett Townsite pool. This does not include wasted oil and gas. The present average daily production per well is about 25 bbl.

In the Northwest Extension pool, at the end of June, 1920, there had been 1,251 wells drilled in a proved area of 2,440 acres. This is an average of 1.8 acres per well. This does not include the George and General pools. Up to the end of June, 1920, the Northwest Extension had produced 20,000,000 bbl. of oil. The average daily production, fourteen months after discovery, was 45 bbl. per well.

The average production, per acre, of the Townsite pool up to the end of June, 1920, was 10,275 bbl. and for Northwest Extension it was 8,200 bbl. Using an average sand thickness of 21 ft. for Northwest Extension and 28 ft. for Burkburnett Townsite and an assumed porosity of 15 per cent, the original oil content of the two pools is estimated at 24,070 bbl. per acre for Northwest Extension and 32,097 bbl. per acre for the Townsite pool. This would indicate a higher expectation for the Townsite pool than for Northwest Extension. Production decline curves indicate, however, that the Northwest Extension can be expected ultimately to produce at least as much again per acre as it has produced to date, but the Townsite pool will do well to produce half again as much oil as it has produced to date. This would give an ultimate recovery of 16,400 bbl. per acre for Northwest Extension and 15,400 bbl. per acre for Townsite pool.

One Well to Five Acres Constitutes Normal Drilling Plan

It has been stated that one well to each five acres would have been a normal program for oil men to follow if the field had been left to them to develop, instead of to speculators. In getting oil out of the ground there are naturally two extremes which can be followed. The wells can be drilled as close together as possible and the oil quickly removed, or, theoretically, one well, drilled near the center of a pool, should ultimately exhaust the pool.

Even with one well to five acres there will be interference. Each well, and its future behavior, becomes affected by its neighbors. As the gas pressures, which drive oil into the wells, drop, productions of old wells decline. Gushers stop flowing and are put to pumping. Presently there is not sufficient pressure to force oil

into the hole, and vacuums are placed on the wells. Close drilling aggravates all of these conditions. In June, 1920, the fluid level had dropped so low in the Burkburnett Townsite pool that oil would only rise, in the hole, half way up through the sand. Because of close drilling and marked interference of wells, the productive history of Burkburnett Townsite and Northwest Extension is practically a duplicate of the productive history of any oil well of either pool. The result of this interference was that in the Burkburnett Townsite pool, for example, within six months after the discovery well was drilled, the average *initial* productions of wells had dropped to 300 bbl. in the first twenty-four hours, and, in July, 1919, in this same field, which a year previous had boasted of 2,000-bbl. gushers, the average initial production of new wells was 36 bbl. per day.

Naturally, it seems that where so much oil was produced and sold, a profit must have been made. A rough accounting, as between costs of development and receipts from production up to June, 1920, for Burkburnett Townsite and Northwest Extension, not including George and Central pools, shows that much oil must yet be produced to show a profit on the venture as a whole. As it stands, many concerns have undoubtedly operated at a profit and still many more are represented by stock certificates with only a historical value. In addition, there are many dependent operations of a magnitude almost as great as oil production. These include oil and gas pipe lines, tank-car transportation systems, refineries and casing-head gasoline plants.

The following are items of cost of development, production, and losses compared with the sales value of oil produced to date:

COSTS

Wells and equipment within proved acreage—2,136 wells (Estimated at $18,000 per well, including drilling, buildings, tanks and production equipment)	$38,448,000
Acreage:	
3,705 proved acres at $7,500	27,787,500
1,665 contiguous barren acres at $1,000	1,665,000
"Dry" wells—226 wells at $15,000 (Dry wells surrounding two pools, junked and abandoned)	3,390,000
Cost of production—33,000,000 bbl. at 20c. per bbl	6,600,000
Losses:	
Lightning, fire and wind	1,020,000
Oil (660,000 bbl. at $2.25)	1,485,000
Total	$80,395,500

SALES OF OIL

33,000,000 bbl. of oil at $2.25	74,250,000
Deficit	$6,145,500

The above account is not given as a valuation, as it is by no means a complete statement of expenditures, losses, and gains in the Burkburnett speculation. It simply shows costs of putting holes into the ground to take oil out of the ground up to the time the two pools had passed into the depleted class and were, therefore, of no further interest to the speculator. There were two other phases of the speculation not entirely dependent upon the basic receipts from production—(1) expenditures in the promotion and sale of stock and (2) bartering in royalties. If all of the wells had been gushers and all of the oil had been turned into the Red River most of this business would have gone merrily on.

In setting an estimated cost of $18,000 per well for development, the costs of cleaning out with cable tools, buildings, tanks and all equipment necessary for the operation of a producing property are included. It is thought that this is a conservative figure and that it is probably low.

A value of $7,500 per acre is given for proved acreage. It is probable that, as an average, this figure is also low. Some acreages started off at a low figure, and much trading was done in acreage, with profit. After the trading was all over, however, the then holders of acreage had to look to sales of production for a profit on their investment. Many wells on small tracts in Northwest Extension were still waiting, six months or more after discovery of the pool, to be drilled into the sand. The owners of these tracts could hardly hope to get sufficient production to pay for the investment.

The 1,665 contiguous barren acres represent narrow strips on the edges of the pools in which "dry" holes were drilled, thus proving the productive limits of the pools. These are justly chargeable against the venture, because in most cases stock was sold and wells were drilled with the promise and expectancy of being classed among the winners.

The cost of those "dry" wells is set at $20,000, and $5,000 per well is allowed for junk value, making an average net cost per well of $15,000. Many of these were deep holes and cost much more than $20,000 to drill.

Pumping Expenses Consumed Fuel Oil

The cost of production is set at 20c. per barrel. This is thought to be a reasonable figure, although probably low. Many wells were swabbed during the first thirty to ninety days of their productive life at a cost of $100 or more per day. As the wells declined, production costs rose, and in single-unit steam pumping plants, using 12 to 18 bbl. of fuel oil daily, operators were literally burning all the oil they produced to keep the wells pumping.

Under losses, the estimated losses owing to the destruction of property by lightning, fire, and wind, as reported by various oil-trade journals, are summarized. Undoubtedly there were other losses which did not come to my attention. The hazard of loss by fire was greatly aggravated by the way buildings, boilers, derricks and oil storage were crowded together.

It is known that a great deal of oil was lost through willful wastage, through seepage and evaporation. Two per cent of total production is the quantity used for this item. Losses owing to evaporation alone would more than cover this amount.

Against all of the above costs are set the receipts for 33,000,000 bbl. of oil sold at an estimated average price of $2.25 at the well. That is, up to June 20, 1920, $74,250,000 had been returned, from oil, on expenditures and losses amounting to more than $106,000,000.

Enterprise Represents Extravagance

The two pools could have been developed economically with 740 wells, which would be sufficiently rapid and close drilling on 3,700 acres of land in two years' operations. These wells at $18,000 each would have cost $15,380,000, as against the cost of $38,448,000 for the wells actually drilled. The pool would have been developed by oil operators, and because of the smaller number of wells there would have been no need to employ hundreds of workers inexperienced in either drilling for or producing oil. There would have been less congestion and therefore less hazard from losses owing to lightning, boiler explosions, and accidental fires. Wells would have been operated in larger groups and production costs correspondingly lowered. More careful drilling would have possibly proved the presence of shallow productive sands which, there is good reason to believe, exist.

NEWS FROM THE OIL FIELDS

The Situation of Austria's Petroleum Industry

From Our Vienna Correspondent

Vienna, Nov. 28, 1920—The two great world-embracing oil concerns, Standard Oil and the Dutch-English group, continue their struggle for the dominant power in all the producing and consuming territories. There is no sign of any relaxation of the compulsory rationing (Zwangbewirtschaftung) among Central European consumers. In the past few weeks the supplementary supplies (Zuschübe) were very satisfactory because the wares delayed in Poland by previous military conditions could now be forwarded and the oil boats on the Danube loaded during the summer also arrived from time to time. The previous shortness in petroleum products has now given way to heavy offerings of benzine, gas oil, and lubricating oil. On the other hand, the supplies of illuminating oil are far from meeting the need.

The Austrian situation has also been slightly improved, because the shipments of the last few weeks seem to have been sufficient with existing supplies to meet needs up to the end of January. The persistent shortage in illuminating oil is due to the lack of tank cars on the railways and the extraordinary low stage of the Danube, so that the purchased supplies have not been able to materialize in sufficient volume just at this season of maximum consumption. However, the supply of illuminating oil already stored in Austria, together with the amount on the way, permits the domestic ration to be increased beyond that of November, and also an increase in the supplementary reserves assigned for distribution by the government. The latter will probably be able to increase the quotas for factory and house industrials. Appropriate quantities are also assured for agricultural premiums offered for grain deliveries. In the face of this apparently favorable situation one cannot suppress a fear that traffic disturbances, such as are all too frequent in the winter, and an over early closing of Danube navigation may again interrupt supplies. It therefore seems necessary to continue the existing economic measures, particularly in the case of illuminating oil.

The rise in Polish exchange, which continued into the first days of November, and the sudden rise in Rumanian values have further increased prices, and no fall may be expected until existing stocks, purchased under high exchange, have been disposed of. Petroleum stations would have held the oil price at its former level while raising prices for benzine and other products.

Wyoming Districts Produce in Excess of Handling Facilities

From Our Special Correspondent

The Standard Oil Co. of Indiana is adding 135 high-pressure stills to its plant at Casper. The number now in operation is 100.

One of the largest wells in the Salt Creek field was completed a short time ago by the Salt Creek Consolidated Oil Co. on Sec. 31-39-78. The well is making 3,500 bbl. daily.

During October 38 wells were completed in the state. Of these nine were failures, four were gas wells, and the others made a combined production of 2,415 bbl. daily. On the first of November 385 rigs were in operation.

Production in the Wertz and Ferris districts has reached the stage that pipe lines are no longer able to handle the oil. Several wells have been drilled to the producing sand and must wait, while some producing wells have been shut in. In a few cases the gas pressure is too great to permit the wells to be shut in without injury and the oil is run into earthen tanks.

Oil, together with a great deal of water, has been struck in a well being drilled at the Centennial Valley Oil Co. near Centennial. An attempt will be made to case off the water. The well is located in T. 15 R. 7, in the Laramie region.

Increase in Kentucky Production

From Our Special Correspondent

A total of 7,147,089 bbl. of oil was produced in Kentucky during the ten months ended Oct. 31, according to the report of E. E. Loomis, secretary of the Kentucky Oil Men's Association, made at the annual meeting in Lexington on Dec. 11. This is an average monthly production of 714,708 bbl. The production in October was 746,819 lb., which shows that there has been a gradual increase during the current year.

An influx of oil operators is expected in Edmonson County following the recent discovery of oil near the Warren County line. This is new territory. Late reports from Johnson County show that the initial well of R. A. Chiles and the Cumberland Petroleum Co., recently brought in on Keaton's Fork, is one of the best in that territory, the first day's production amounting to 135 bbl.

Work on the test well on the Burchett farm, Logan County, is progressing favorably. The test is now down over 200 ft.

Drilling operations in the Lawrence County field have been suspended by the Ohio Fuel Oil Co. and some of the other companies.

Texas Notes

From Our Special Correspondent

Fire at Baytown on Dec. 8 destroyed the Humble Oil & Refining Co.'s unloading dock and trestle, together with several empty oil tank cars. Total loss was about $250,000.

It is reported that Stone & Webster have acquired a controlling interest in the Simms Oil Co. The general office will be moved from Houston to Dallas.

Some wells of considerable interest have been completed recently in the Gulf Coast region. In the old, nearly dormant field of Markham, Matagorda County, the No. 1 Meyers well was completed by C. G. Hamil et al. and came in flowing 500 bbl., with the bailer stuck in the hole. Later report states this flow has materially increased. The well is on the northeast edge of the dome, and is 1,590 ft. deep. The salt in this dome is 2,800 ft. deep, and all wells so far have made their production from strata immediately above the cap rock.

At Goose Creek the No. 1 Adey well of the International Oil Co. came in flowing 800 to 1,000 bbl. per day. This well is only 2,100 ft. deep and is west of the creek. Both the depth and location are new for Goose Creek.

The Sinclair Oil Co.'s No. 10 Masterson well, at Damon Mound, came in making an initial flow of 5,000 bbl. from 3,140 ft. This well extends the field somewhat farther to the east around the south end of the dome.

The big wells of the north extension at West Columbia are showing a little less basic sediment in their flow. The percentage of water in these wells is as yet small. The Humble Oil & Refining Co. recently completed its No. 27 Japhet well in this field, with an initial flow of 14,000 bbl. from 3,395 ft.

Louisiana Court Decides Lessee Liable If He Fails To Drill

From Our Special Correspondent

In the suit between Oliver S. Pendar and the Empire Gas & Fuel Co., Pendar has been awarded $60,000. The Empire Co. had promised to drill on Pendar's land and failed to carry out its agreement. This suit has been watched with interest, as it indicates that the lessee, contracting to drill a well and pay the lessor a certain amount out of the proceeds from sales of oil from the well, is liable to the lessor for the consideration promised if the well is not drilled.

The coastal fields have been quiet. The only completion at Vinton recently was the Texas Co.'s No. 14 Gray well, now producing 75 bbl. by pumping from 2,275 ft. Vinton field is producing about 3,600 bbl. daily.

Book Reviews

A Student Reverie: An Album of Saxony Days. By Frederick Gleason Corning, E.M., L.L.D. Cloth; pp. 69; 7½ x 10¾. New York, 1920. Published privately.

This is a charming and unusual volume, written in an instructive yet leisurely and at times whimsical mood, which plainly it was a recreation to the writer to pen. The book will be a treasured memorial for his friends. An old Freiberg man, he sends his thoughts back to the picturing of the famous old mining school which produced so many great American engineers, in the days before our own mining schools had grown to full stature. He pictures Freiberg from the educational, mining, social, and sentimental side, with delightful leisurely reminiscences of old-time friends, like "Jack" Hammond (John Hays), Franklin Guiterman, R. W. Raymond, and others. To illustrate his freedom from strain, it may be noted that the author, happening to touch on the charms of Saxon girls in those good old days, digresses for a couple of pages to comment humorously on the extremely elevated skirt of the present-day fashion.

As a record of a notable period in the history of American mining education, with a group of distinguished engineers who did so much to develop mining in this country and the rest of the world, this book has real historic value.

In these days of poor paper and indifferent typography, the book is also surprising, for it is a modest "edition de luxe" and the details of paper, type, and illustration have evidently been attended to with artistic and loving care. The volume is dedicated by the author to his wife. J. E. S.

The Mining Laws of the British Empire and of Foreign Countries, Vol. 1, Nigeria. By Gilbert Stone. Cloth; pp. 254; 6½ x 10. Published by H. M. Stationery Office, Imperial House, Kingsway, London W.C.2. Price, 15s.

The author of this book worked under the advice of the legal committee of the Imperial Mineral Resources Bureau, assuring comparative accuracy and correctness in its preparation. He had little or nothing to guide him, having to gather his materials from various sources, so the difficulty of his task may be appreciated.

With the union of Northern and Scuthern Nigeria, in 1914, into a single British Protectorate, all former mineral ordinances and regulations were repealed, their place being taken by the Minerals Ordinance of 1916, as amended by the Minerals (Amendment) Ordinance of 1918, and, so far as mining for mineral oil is concerned, by the Mineral Oil Ordinance of 1914.

Various regulations have been issued under the Minerals Ordinance of 1916. Other ordinances, concerned in part with mining law, or relating to collateral subjects, such as land registration, stamps, master and servant, surveys, explosives and leaseholds, are considered. Being a British colony, the English common law, the doctrines of equity and the statutes of general application of Great Britain in force in England on Jan. 1, 1900, are in force in Nigeria, subject to the terms of any Nigerian ordinance.

The author has arranged the matter into two parts, the first being a general analysis of the country's mining law, and the second devoted to an orderly statement of the ordinances and regulations, notices and forms. A detailed index adds much value to the volume. As yet there is no case law in Nigeria except that applied from outside decisions.

Mining engineers and executives, prospectors, and financiers may depend more on their own knowledge of the mineral law of Nigeria by making use of this book. W. G.

Technical Papers

Marble—U. S. Geological Survey Bulletin 682 (price 30c. from the Superintendent of Documents, Washington, D. C.) is a 118-page pamphlet entitled "Marble Resources of Southeastern Alaska." It is a very practical treatment of the subject, describing the deposits not only from the standpoint of the geologist and miner but also devoting many pages to commercial considerations. Many excellent photographs showing the uses of marble are included, as well as colored plates of attractive specimens.

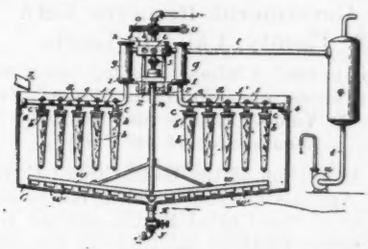
Oklahoma Oil Map—The Petroleum Station of the Bureau of Mines, in cooperation with the Bartlesville Chamber of Commerce, has issued a map of the Hewitt oil field, Carter County, Okla. This map is drawn to the scale of 1 in. equals 1,000 ft. and shows locations of all rigs, drilling wells, producing wells and abandoned holes in Township 4 south, Range 2 west, up to the date of Nov. 1, 1920. Copies may be obtained from the Bartlesville, Okla., Chamber of Commerce for 35c. each.

Talc—"Talc Mining in New York" is the subject of the Bureau of Mines *Reports of Investigations*, Serial No. 2,171, obtainable upon request from the Bureau at Washington. This pamphlet of fifteen pages is confined largely to brief descriptions of the mines and mills of four companies. Flow sheets are given in each case.

British Columbia — The Geological Survey of Canada, Ottawa, has published as Memoir 117 a seventy-three-page bulletin on the geology and ore deposits of the Ainsworth mining camp, in British Columbia. The valuable metals are lead and silver. The Consolidated Mining & Smelting Co. and the Florence Silver Mining Co. are actively interested in the district.

Recent Patents

Thickener—No. 1,359,162. A. L. Genter, Salt Lake City, Utah. A modification of the earlier design of Genter thickener, in which the filter elements



are suspended in a tank as shown in the illustration. A vacuum is maintained inside of the filter elements.

Classifier—No. 1,359,105. R. H. Richards, Jamaica Plain, Mass. A method of separating granular matter from the colloidal material in slimes, which consists in feeding diluted slime to a circular table the surface of which is inclined sufficiently to cause the forward movement of colloids, but insufficiently to permit a substantial forward movement of granular material.

Hydrometallurgy of Copper — No. 1,358,619. N. C. Christensen, Salt Lake City, Utah. The process patented consists in lixiviating the ore with a solution of SO_2 and precipitating the copper from the pregnant solution as a cuprocupric sulphite by adding Cu_2O. By means of the process outlined in another patent, No. 1,357,952, Mr. Christensen precipitates the copper in the same form by adding metallic copper.

Roasting Copper Ore—No. 1,358,293. W. H. Corbould, Selwyn, Queensland, Australia. The process described embodies roasting in a furnace of special design in which the ore is alternately subjected to pressure and vacuum during the calcining operation.

Flotation Process—No. 1,357,556. D. F. Haley, Wallace, Idaho. By this process the ore pulp is circulated through a pipe which terminates somewhat above the pulp level in the cell. The air is entrained as the stream of pulp strikes the surface of pulp in the cell, somewhat in the manner of the cascade system of flotation.

Hydrometallurgy of Copper — No. 1,357,495. W. E. Greenawalt, Denver, Col. The copper is dissolved from the ore by acid, resulting lean and rich solutions being kept separate. The rich solutions are electrolyzed, the salts of the elements with a variable valency being raised to a higher valency. From the lean solution the copper is precipitated as the sulphide, the resulting copper sulphide, along with SO_2, being used in treating the rich solution.

Amalgamator—No. 1,354,497. Francis M. Lewis, Seattle, Wash. A new design of amalgamating plates.

Oil-Well Controller—No. 1,354,694. Charles E. Sage, Rochester, N. Y.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Government Recovers Kern County, Cal., Oil Lands

Companies' Claims, Resting on Conveyances and Contracts, Found To Be Void—Fixtures and Improvement's Revert to Public

A decision of the U. S. Circuit Court of Appeals denying a rehearing in the case of the United States against the Chanslor-Canfield Midway Oil Co., the Recovery Oil Co., Fred H. Hall and others, re-establishes the right of the Government in certain public mineral lands in Kern County, Cal. This land came with the area of the Presidential withdrawal order of Sept. 27, 1909. It had been located as an oil placer mining claim in 1903 by Hall, in the names of two members of his family and seven of his neighbors. These neighbors were ignorant of this action, and when subsequently advised thereof declined to pay any of the expenses incident thereto, or to ratify what had been done; but they did execute a deed to one of Hall's family for his benefit, conveying what interest they might have, if any. About five years later the family holdings were conveyed to Hall, who in 1909 made the development contract under which the Midway Oil Co. entered in possession. By this contract Hall retained one-half of the quarter section, which half was conveyed to the Recovery company in 1910.

The United States brought suit to restrain waste and depletion of the oil from the lands, to enjoin defendants from asserting title or interest in the lands, from trespassing thereon, for the appointment of a receiver and for an accounting. The District Court found that, although there was no previous agreement between Hall and his neighbors that the location made in their names should inure to Hall's benefit, and no conscious intent to violate the law, the manifest effect of the transaction, if valid, was to enable Hall to acquire more land by one location than the law permits, and would therefore be invalid. The rule of law is quoted:

"Any scheme or device entered into whereby one individual is to acquire more than that amount (twenty acres) or proportion in area constitutes a fraud upon the law, and consequently upon the Government, from which the title is to be acquired, and any location made in pursuance of such a scheme or device is without legal support and void."

The Circuit Court of Appeals is satisfied that the locations were wholly invalid, that Hall gained nothing by taking the deed from the named locators to a member of his family, and thereafter from this party to himself. Therefore he had no right or interest to convey and conveyed nothing.

Another point contended for by the companies was that by the Pickett Act, the act of Congress of June 25, 1910, they were given the right to continue in possession of the lands and prosecute their work to a discovery, and thereupon to have patent to said lands, thereby to that extent abrogating whatever effect the Presidential withdrawal order of 1909 had on the lands; that the entry of the lands and the development thereof was pursuant to invitation of the United States under its policy established long before the withdrawal order. But the court found the facts did not show such diligent prosecution of work for discovery on the lands at the date of withdrawal as to take them out of the operation of the withdrawal order. It was admitted that there was no work on the lands at that time, or for months afterward, but it was claimed that the companies were then making preparations by assembling material and employing labor for future development. The companies owned or controlled many claims in the neighborhood, some of which were being operated and developed, but it did not appear that any work or preparation therefor was intended for the development of the particular lands in question, as distinguished from the company's other undeveloped holdings. The court said the law contemplates and requires something more to bring an occupant or claimant within the saving clause of order of withdrawal on the Pickett Act (Comp. Sts. 4523-4525).

Again, it was contended that because the agents of the Government had full knowledge of the situation, and not only refrained from advising people but induced them to proceed and expend money in good faith, the United States is estopped to enforce its claims. But the court said the law on this proposition is that the United States is neither bound nor estopped by acts of its officers or agents in entering into an arrangement to do or cause to be done what the law does not sanction or permit; neither is laches or neglect of the United States, as a general rule, on the part of officers of the Government a defense to suit by the Government to enforce a public right or protect a public interest.

The District Court gave the United States judgment in damages for $76,751 and decreed that all fixed improvements upon the lands belonged to the United States and should be turned over, together with the lands, free of all claims of the companies or others. The Circuit Court of Appeals modified this decree so as to allow 7 per cent interest to the Government upon the value of the oil from date of its conversion.

Osceola Lead & Zinc Co. Loses Appeal

Missouri Supreme Court Upholds Circuit Court in Sustaining Lien of Forest City Lumber Co.

The Osceola Lead & Zinc Mining Co. has lost its appeal to the Supreme Court of Missouri from judgment against it in the Jasper County Circuit Court in favor of the Forest City Lumber Co. Damages were claimed by the latter because the mining company had removed two steam boilers, an engine, and other pieces of machinery and appliances used in carrying on lead and zinc mining, upon which the lumber company held a mechanic's lien, from Newton County to Jasper County. The lien had been filed against the Sleepy Hollow Mining & Development Co., in Newton County. The articles of equipment and machinery had been in Jasper County before the lien claim was filed, and had been taken from Jasper County to Newton County by the Sleepy Hollow company after it had acquired title to them by purchase from their original owner, the Leroy Mining Co. To secure payment of the purchase price the Sleepy Hollow gave a deed of trust on the articles in favor of the Leroy Mining Co. The Sleepy Hollow company moved the property to Newton County and the deed of trust was recorded in this county. The mechanic's lien of the lumber company was established in this county. Later the property was sold under the deed of trust and purchased by the Osceola company, which moved it back to Jasper County.

The lumber company established its lien as prior to defendant's lien under its deed of trust in the Newton Circuit Court; and in the Jasper Circuit Court it obtained a judgment against the defendant Osceola Mining Co. for the latter's removal of the property. The appeal of the Osceola company from the judgment in the Jasper Circuit Court has been dismissed by the Supreme Court.

Colorado Court Holds Contract Power Rate Valid

The Supreme Court of Colorado has handed down a decision favorable to the Golden Cycle Mining & Reduction Co. in each of two suits brought by it to secure modification of an order of the Public Utilities Commisson requiring the mining company to pay a greater rate for electric current than that stipulated under a contract with the Colorado Springs Light, Heat & Power Co. The order from which appeal was made in one case required the mining company to pay about $10,000 a year more than its contract price. The court held the rate was fixed without authority.

ECHOES FROM THE FRATERNITY

New Mexico's Legislative Commission Recommends Repeal of Mine Taxation Laws

The commission appointed at the last session of the New Mexico Legislature to investigate and report on proposed changes in the laws and methods of administration of the state recently issued additional portions of its report.

In the chapter on mine taxation the report brands the whole system of the law as inexact and arbitrary in its methods of arriving at market value, and as inequitable both as between mines and other classes of property, and as between different mining properties within the class.

Concerning the "contiguous property" clauses, the report regards them as lacking an adequate excuse for their existence. It recommends that, whatever method of taxing mines is adopted, only such reserves shall be allocated to producing mines as are reasonable from an engineering and economic point of view.

As to the new plan the report continues: "In our opinion the only proper way to arrive at valuations of mineral reserves is to vest the State Tax Commission with power to fix the values and to provide them with professional assistance. Any attempt to impose arbitrary limitations is apt to result in under-assessment and is certain to result in inequality. In case of over-assessment there is always resort to the courts, and since properties of this type are usually held in large blocks that resort will not be closed because the expense of appeals is out of proportion to the amounts involved."

Specific Recommendations

The specific recommendations are:

"1. That all legislation providing for special procedure in connection with the taxation of mines, including the contiguous property clause, be at once repealed.

"2. That new legislation be passed specifying that all mining property shall be valued on precisely the same general principles as other real estate.

"3. That power to assess all mines and mineral property be vested in the State Tax Commission as reorganized in accordance with our recommendations made elsewhere in this report.

"4. That the tax commissioner be supplied with the necessary professional assistance."

The sum of $25,000 is named as necessary to make the initial valuation. It is further recommended that an engineer of national reputation be engaged to undertake the work; that it would be highly desirable to retain one of the principal assistants in the original valuation as a permanent employee of the Tax Commission at a salary of about $4,500.

Le Roy Memorial Scholarship Needs More Funds

At a smoker held by members of the British Columbia University Service Club in Vancouver, B. C., last month, Dean R. W. Brock of that university outlined the present standing of the Le Roy Memorial Scholarship and expressed confidence that no difficulty will be experienced in raising the $10,000 required to place the fund on a secure basis. Major Brock explained that "the scholarship, which is in memory of comrades killed in the late war, is for the purpose of enabling a returned soldier student at the British Columbia University to commence or complete a degree course when, through wounds or other disability, he could not afford to do so. The first scholarship award, made last spring, was of the value of $250, for which a capital sum of $3,000 had been raised; but this sum was quite inadequate to meet the expenses of a beneficiary. The scholarship is named in honor of the late Capt. O. E. Le Roy, who commanded the British Columbia detachment of the Western Universities Battalion, and who was killed while serving with the 46th Battalion in front of Passchendaele." Three hundred members of the club were allotted to two teams to make a "drive" to raise the needed money. The late Captain Le Roy was one of the geologists of the Geological Survey of Canada, and did much geological field work in mining districts of British Columbia for a number of years.

Secretary Payne Would Improve Alaskan Steamship Service

Discussing Alaska's needs the Secretary of the Interior in his report to Congress has the following to say:

"At the threshold of Alaskan development is the subject of transportation. Adequate steamship service with reasonable rates for passengers and freight from the Pacific Coast to Alaska is imperative; now the service is inadequate. The Alaska Steamship Co., under the same control as the Copper River Railroad and the copper interests in Alaska, and the Pacific Steamship Co., operate a more or less regular service. There is not enough business for both companies. Ordinarily the boats run about 50 per cent capacity, while during the spring and fall, peak-load seasons, persons and freight are compelled at times to wait weeks for space. The Alaska Steamship Co. has a strong position in that its copper ores mined in Alaska furnish return cargoes for its boats.

"A simple solution of the problem would be to consolidate the two companies, and reduce expenses by taking off unnecessary boats during ordinary times. This would give a reasonably full cargo at all times. Then secure from the Shipping Board, if need be, additional boats to meet peak-load demands which come uniformly in the early spring and early fall, the Shipping Board to see that a substantial reduction in rates and fares results. The board has ample power to do this. Efforts have been made to accomplish this result but so far without success, the Alaska Steamship Co. refusing to sell.

"Unless some such plan is effected the necessity for a genuine development of Alaska may make it necessary for the government to operate its own line of steamships to Alaska, even at a loss, and provide an adequate service at reasonable rates."

Engineering Standards Committee Adds New Member Bodies

Twenty-four Organizations Now Represented—Officers and Executive Committee Elected at Annual Meeting

The American Engineering Standards Committee has recently been enlarged by the representatives of the following four additional member bodies: Department of Agriculture, Department of the Interior, Gas Group, consisting of American Gas Association, Compressed Gas Manufacturers' Association, International Acetylene Association, and the American Electric Railway Association.

There are now forty-seven members of the committee, representing seventeen member bodies in all. Twenty-four organizations are represented on the committee, as three of the member bodies are groups of organizations.

At the annual meeting of the committee held in New York City on Dec. 4 A. A. Stevenson, of the American Society for Testing Materials, was re-elected chairman for 1921 and George C. Stone, of the American Institute of Mining and Metallurgical Engineers, was re-elected vice-chairman.

The following were also elected to represent the respective member bodies on the Executive Committee: Comfort A Adams, American Institute of Electrical Engineers; Martin Schreiber, American Society of Civil Engineers; Fred E. Rogers, American Society of Mechanical Engineers; A. H. Moore, Electrical Manufacturers' Council; Dana Pierce, Fire Protection Group; A. Cressy Morrison, Gas Group; N. A. Carle, National Electric Light Association; Albert W. Whitney, National Safety Council; Coker F. Clarkson, Society of Automotive Engineers; Thomas H. MacDonald, Chief of Bureau of Public Roads; E. B. Rosa, chief physicist, Bureau of Standards; O. P. Hood, chief mechanical engineer, Bureau of Mines; F. J. Cleary, Navy Department, and J. H. Rice, War Department.

MEN YOU SHOULD KNOW ABOUT

Harris & Ewing, Photo.
MARION E. RHODES

Quite contrary to the usual order, the new chairman of the Committee on Mines and Mining of the House of Representatives, **Marion E. Rhodes,** is intimately familiar with the mining industry. Mr. Rhodes comes from Potosi, Mo., and represents in Congress the Thirteenth Missouri district, which includes the counties of Bollinger, Carter, Iron, Jefferson, Madison, Perry, Reynolds, St. François, Ste. Genevieve, Washington, and Wayne. These counties in 1919 produced 92 per cent of the lead output of Missouri, the prime lead-producing state of the union for twenty years past. When the census of 1910 was taken Mr. Rhodes' Congressional district was a large contributor to the state's output of zinc and barytes, in whose production the state also led at that time. Washington County, Mo., the new chairman's home, produces 75 per cent of Missouri's output of barytes; and Madison County is the only point in the United States where cobalt is continuously produced.

Mr. Rhodes will resign his place on other committees that he may give his undivided attention to the Committee on Mines and Mining. In conversation with the correspondent of the *Engineering and Mining Journal* Mr. Rhodes stated that he has noticed the great zeal of the chairman of the Committee on Agriculture, and the chairmen of other committees, to be intensely active to better the conditions surrounding the industries with which their committees have to deal. It is his intention to do exactly that thing for the mining industry. In his opinion the mining industry today as never before needs encouragement, when lead, zinc, copper and other metals are selling at prices entirely out of proportion to the costs of their production.

Immediately after the first of the year Mr. Rhodes plans to begin a series of hearings on various measures which are before his committee. In addition, he expects to make inquiry into some of the economic phases of the mining industry, in an effort to determine what steps are possible to provide for the stimulation of mining.

George I. Adams has accepted the chair in geology at the University of Alabama.

E. C. Harder has returned from a trip to South America in the interest of the Aluminum Company of America.

J. P. Dunlop is making a tour of the mines in the Middle West in connection with mineral-resources statistics.

F. W. McNair, president of Michigan College of Mines, Houghton, Mich., was a recent visitor in New York City.

H. G. Palsgrove has been appointed superintendent of mines for the Smuggler Union Mining Co., Telluride, Col.

John White, field engineer for American Metals Co., Ltd., is making examinations in the Lordsburg, N. M., district.

W. Motherwell, who has been running a series of flotation tests at Allenby, B. C., has returned to San Francisco, Cal.

James P. Porteus, superintendent of the Bonney mine at Lordsburg, N. M., will be in San Francisco until the first of the new year.

Ross B. Hoffmann, mining engineer of Oakland, Cal., is in New York City, and expects to sail for London on professional business Dec. 28.

F. Leslie Ransome is engaged in geologic work on the ore deposits of the Oatman district of Arizona. He is being assisted by **M. G. Gulley.**

"Pat" Sweeney, mill superintendent for the Kennecott Copper Co., and **William Clulow,** assistant engineer, have resigned those positions and are now in Seattle.

Max G. F. Söhnlein, consulting mining engineer, of Santiago, Chile, was in New York City this week. He sailed for Chile on the "Essequibo," on Dec. 21.

W. J. Loring and **James F. Callbreath, Jr.,** president and secretary, respectively, of the American Mining Congress, were in New York City last week.

Edward J. Maney, general manager of mines on the Mesabi Range, Minnesota, for the Shenango Furnace Co., has gone East to attend to business matters.

E. S. Larsen, of the Geological Survey, has completed an examination of certain contact-metamorphic tungsten deposits in New Mexico, California, and Oregon, and has returned to Washington, D. C.

Charles N. Bell, of Telluride, Col., has resigned as superintendent of mines for the Smuggler Union Mining Co. to accept an appointment with the Mines Exploration Co. Hereafter his headquarters will be in Denver, Col.

W. J. Olcott, president of the Oliver Iron Mining Co., and **F. E. House,** president of the Duluth & Iron Range R.R., are in New York attending a meeting of the presidents of the subsidiary companies of the U. S. Steel Corporation.

Dr. Eugene F. R. Haanel has retired from the position of Canadian Director of Mines in accordance with the provisions of the superannuation act. Dr. Haanel became superintendent of mines in connection with the Interior Department at Ottawa in 1901, and was appointed Director of Mines in 1907, when that department was organized. On Dec. 14, 1920, he was presented with an appreciative farewell address from forty of his recent associates in the Department of Mines, testifying to the value of his scientific work and his personal worth.

SOCIETY MEETINGS ANNOUNCED

The American Society of Mechanical Engineers announces that the Waterbury, Conn., branch meeting in the Chase Company Office Building, will be addressed on Jan. 3, 1921, by Capt. Harry George, who will describe "Mining Experiences of a Prospector." On Jan. 10 the Hartford, Conn., branch will be addressed, at the City Club, by Carl L. Lesher, editor of *Coal Age,* on "The Responsibility of the Coal Buyer."

On Jan. 14 the "Story of Petroleum" cinema, by the Bureau of Mines, will be shown before the meeting of the Columbus, Ohio, section of the A. S. M. E. at the Engineers' Club in the Southern Hotel, that city.

On Jan. 25 the Atlanta, Ga., section of the A. S. M. E. meets with the local section of the A. S. C. E. in the Carnegie library building. B. M. Hall will speak on "Water Power Development." Mr. Hall, who is now with the Georgia Railway & Power Co., was a supervising engineer with the U. S. Reclamation Service and organizer and chief engineer of the Porto Rico Irrigation Service from 1908 to 1910.

OBITUARY

Capt. George Brewer, of Bessemer, Mich., died suddenly of heart failure on Dec. 14, while answering a summons to appear as a talesman at the courthouse. Capt. Brewer was seventy-eight years old, and one of the oldest mining captains on the Gogebic Range. In 1885 he opened the Aurora mine, near Biwabik, Minn., one of the oldest properties on the Mesabi Range, and since that time had been directly affiliated with the mining industry. He was generally in the employ of the Oliver Iron Mining Co.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

WEEKLY RÉSUMÉ

The number of mining companies that have been compelled to reduce wages, and to curtail or suspend production altogether, owing to market conditions, is steadily increasing. Prominent in the list of camps so affected is Butte, where a reduction of $1 per day, affecting all miners, has been announced. Charles Butters has proposed in a letter to E. P. Earle, president of Nipissing, that all copper and silver producers shut down, the quicker to bring about a better market. The Consolidated M. & S. Co., at Trail, is said to be refining custom ore except where the shipper is prepared to finance the carrying or marketing of the bullion. In Arizona, a receiver has been appointed for the Tennessee and Schuylkill mining interests. At Douglas the Apache Powder Co. is erecting a fuming acid plant at the C. & A. smelter. In California, a friendly suit for a receiver has been brought against the New Idria Mining Co. In Nevada, the Prince Consolidated and Virginia Louise mining companies are both planning to increase their capitalization. Drilling by the Nevada Consolidated at Ruth has indicated the presence of a new orebody.

In Washington both Senate and House favor the plan requiring assessment work on mining claims to be done in 1920, but allowing six months' grace for doing this work. Mineral export tariff bills are likely to be held over until next session.

Cananea's Suspension Postponed

The Cananea Consolidated Copper Co. of Cananea, Sonora, Mex., has decided to postpone until Jan. 15 the suspension of operations that had been announced for Dec. 15. No new men are being engaged and the operating force is now at a minimum. Five furnaces are being operated.

Canada Copper Mill Shuts Down

The new 2,000-ton concentrator of the Canada Copper Corporation at Allenby, British Columbia, has shut down owing to the condition of the copper market. This mill was placed in operation on Oct. 18 of this year, since when twenty-five carloads of copper concentrates, running from 40 to 50 tons per car, have been shipped to the smelter of the Consolidated Mining & Smelting Co. of Canada at Trail.

Control of American Smelting & Refining Co. Assailed By Karl Eilers

Guggenheims Disregard Stockholders' Interests and Operate Company for Own Ends, Says Former Vice-President—Asks Writ of Mandamus To Inspect Stock Books

Asserting that access to the stock books of the American Smelting & Refining Co. had been denied him, Karl Eilers, formerly a director and officer of the company and who was defeated for re-election as vice-president at the last annual meeting, has asked the New York Supreme Court to issue a writ of mandamus requiring the company to permit him to inspect the books. In his petition Mr. Eilers alleges that the management of the smelting company is directing its affairs to further its own personal and selfish ends, in disregard of the company's interest, thereby retarding its development and causing it to lose millions of dollars. His purpose in seeking the writ, he states, is to enable him to communicate with other stockholders relative to a change in management at the annual meeting next April. In his personal and representative capacities, Mr. Eilers states, his total holdings of the company's stock are 3,538 shares, a greater number than held by all the officers and directors of the company combined. The petition reads in part as follows:

"In or about 1907 the holdings of stock of the Messrs. Guggenheim, except for a very small portion, were sold by them. As I am informed and believe, such sale was forced upon the Messrs. Guggenheim by reason of business reverses. From that time the Messrs. Guggenheim apparently ceased to regard the interests of the corporation and sought to employ it solely to serve their own ends. In spite of the fact that they no longer held stock in the corporation to an amount which gave them any substantial interest in its affairs, they continued their membership on its board of directors and insisted upon dominating that board and the affairs of the corporation.

"Early in 1919 the said Solomon R. Guggenheim resigned from the board; the said Messrs. Isaac, Daniel and Murry Guggenheim remained upon the board, and the said Simon Guggenheim became president of the company. By that time the Messrs. Guggenheim had so perfected their domination of the company that they did and could with confidence presume the acquiescence of a majority of the directors. When in January of that year they decided that Mr. Simon Guggenheim should become president of the company, Mr. Daniel Guggenheim, the then president, announced this in a circular letter to the stockholders as "the expressed wish of the board of directors." The board of directors had not in fact been notified, much less consulted, in respect of the proposed change in the presidency of the company; they had been given no opportunity to express any wish in the matter. The board met the expressed wish of the Messrs. Guggenheim and elected Mr. Simon Guggenheim their president.

"During all the time aforesaid, from 1907 to 1920, while I was a director and officer of said corporation, I found it impossible for me, or any of my associates on the board of directors, to secure the adoption of any plan for the operation of the company against the opposition of the Messrs. Guggenheim. The majority of the members of the board of directors were controlled absolutely by the orders of the Messrs. Guggenheim and were in fact merely dummies representing the Guggenheim interests. . . .

"About 1910 the board of directors on the orders of the Messrs. Guggenheim and over the protest of myself and Mr. Morse adopted a resolution that the salaries of officers, directors and employees should be fixed by a so-called salary committee, of which Mr. Murry Guggenheim was then made chairman. At this time Mr. Daniel Guggenheim and Mr. Sol Guggenheim had been drawing salaries ranging from $25,000 to $50,000 per annum, while they were devoting almost their entire time and attention to business matters not connected with the affairs of the company. This was a cause of irritation among the other officers and directors. From that time the board of directors had no power to fix the salaries of the officers and directors of the company, and the board of directors could obtain no information from the Messrs. Guggenheim or from those directors who acted in concert with them as to the amount paid to the officers and directors of the company.

"About 1910 Mr. Newhouse and Mr.

Stewart reported an opportunity to enter the business of tin mining in Bolivia. The company with the consent of the Messrs. Guggenheim expended considerable money in a thorough investigation of this proposition. Upon the report of such investigation coming in, the Messrs. Guggenheim opposed any action relative to the proposition. Thereafter the sons of Messrs. Murry and Daniel Guggenheim, representing Guggenheim Brothers, the Messrs. Guggenheim's co-partnership, were permitted to examine the report of the investigation on file with this company, and thereupon Guggenheim Brothers sent representatives to Bolivia and have since engaged in large tin mining operations there. A demand by certain of the directors of the company that it be allowed to share in such operations was refused by the Messrs. Guggenheim.

Company Acquires Interest in Premier Mine

"In 1919 Mr. Guess, managing director of mines for the company, advised the board of directors that he had secured an opportunity to purchase a one-fourth interest in the Premier Silver & Gold Mine in British Columbia at a price which would be most advantageous to the company. A majority of the members of the executive committee of the company to which the matter was referred were in favor of accepting this offer, but Mr. Simon Guggenheim, a member of the executive committee, and Mr. Murry Guggenheim, a director, objected and opposed its acceptance. It later developed that the sons of Messrs. Murry and Daniel Guggenheim, representing Guggenheim Brothers, desired to purchase one-half of such one-fourth interest. Upon an arrangement being effected which permitted Guggenheim Brothers to purchase one-half of said one-fourth interest, Messrs. Simon and Murry Guggenheim withdrew their objection to a purchase by the company of the remaining half of such one-fourth interest.

Company Formerly Sold Metal as Fast as Refined

"The business of the company is the purchase and smelting of ores of various kinds, and the sale of metals, copper, lead, silver, etc., thus produced. The prices paid by the company for the various ores are based on the current New York quotations for the metals in such ores. The company learned from bitter experience that if losses from fluctuations in the prices of metals were to be avoided, metals must be sold as fast as smelted and refined, and only to the quantity smelted and refined; no sales substantially in advance of production could be made. Prior to the domination of the company by the Guggenheim interests this was the established policy of the company.

"In respect of sales of copper, this policy was abandoned as soon as the Messrs. Guggenheim secured predominating influence in the company's affairs. In copper, under the direction of Mr. Murry Guggenheim, futures were dealt in by the company; that is to say, the company made sales for future delivery against ore to be purchased and copper to be produced therefrom. I believe the Messrs. Guggenheim were influenced to this change in policy in respect of copper sales by their interests in various copper companies. I know that through the Messrs. Guggenheim contracts were entered into making this company selling agent for such copper companies. In 1915 I was informed by a Mr. Willard Morse, one of the company's directors, that as the result of this method of selling for future delivery the company was losing on copper at the rate of $1,000,000 per year. A statement prepared by a Mr. F. W. Hills, the comptroller of the company, disclosed losses from this source for the seven years 1912-1919 to aggregate over $5.000,000.

"My fellow directors, Mr. Morse, Mr. Brush, Mr. Newhouse, as well as myself, protested against this policy, but Mr. Murry Guggenheim insisted upon it and its continuance. Mr. Murry Guggenheim attempted to justify these losses upon the ground that the company, through sales for future delivery, was enabled to retain the business of selling for the group of copper companies with which it had entered into the aforesaid contracts to act as sales agent; that this company could thereby retain 1 per cent selling commission from such copper companies. . . . The copper companies to which I refer are the Utah, Nevada Consolidated, Kennecott, Braden, Chino and Ray Consolidated.

"In 1920 the Messrs. Guggenheim carried their policy of gambling in metals further. At this time the copper market showed a tendency toward a sharp decline in prices. Having made the mistake of selling for future delivery in a rising market, the Messrs. Guggenheim now withheld copper from sale in a falling market. In April, 1920, as the result of this policy, the company had on hand approximately 160.000 tons of refined copper. In the meantime the price of copper had declined at least 5c. per lb. ($100 per ton) with a consequent loss, traceable to the Guggenheim influence, of at least $15,000.000 to the stockholders of the companies concerned, the copper companies and this company.

Loss on Lead Much Smaller—Gain on Silver

"In the company's purchase and sales of silver and lead, Mr. Brush continued to follow the policy, previously followed in sales of copper, of selling currently instead of for future delivery. . . . Under Mr. Brush's policy the company made a profit on its transactions in silver, and the company's losses from fluctuation in prices of lead were held down to the comparatively small sum of $465,060.71 for the period 1904-1918. For the same period, under Mr. Murry Guggenheim's policy, the company's losses in sales of copper, according to a statement by Mr. F. W. Hills, amounted to $4,638,934.85. The Messrs. Guggenheim were not so largely interested in silver or lead producing companies as in copper companies.

"Of the directors of the company, Messrs. Prosser, Newhouse, Stewart, Morse, McGowan and I were those who were outspoken in expressing their views relative to the business and policies of the company. . . . At the time when Mr. Simon Guggenheim was elected president of the company, Mr. Newhouse was made chairman of the board of directors. It is significant that immediately after the annual meeting in April, 1920, when I was forced from the board, to which I shall hereafter refer, Mr. Prosser was promoted to the position of vice-president and at the same time three new vice-presidencies were created and three other directors were placed in those offices. The opposition . . . was silenced.

"Immediately after his election as president, Mr. Simon Guggenheim informed Messrs. Stewart and Morse that their services were no longer required, and demanded their resignations. Mr. Stewart ceased to be a director. . . . Mr. Morse was allowed to continue as a director of the company but in a position of no influence and at a greatly reduced salary. At this time Mr. McGowan declined to continue as a director of the company under Mr. Simon Guggenheim and resigned from the board of directors.

"In March, 1920, a few days prior to the regular annual meeting of the stockholders of the company, I received from Mr. Simon Guggenheim a letter informing me that because of the difference in our views relative to the management of the company, I must sever my connection with the company (Mr. Eilers says he refused to resign). In the next month (April) I failed of re-election as a director."

STOCK OF THE AMERICAN SMELTING & REFINING CO. HELD BY MEMBERS OF THE BOARD OF DIRECTORS

	April 1, 1919		April 1, 1920	
	Preferred	Common	Preferred	Common
E. L. Newhouse	700	.....	700	.....
E. L. Newhouse family	340	.....	340	.....
F. H. Brownell	....	5	.....	5
Mrs. F. H. Brownell	....	100	.....	.....
E. Brush and family	205	10	.....	.....
J. Clendenin	390	179	390	179
W. M. Drury	100	120	100	200
Charles Earl	....	40	.....	40
L. G. Eakins	10	.....	10	.....
Karl Eilers and family	3,375	502	3,575	47
L. Frederick	....	1	.....	1
H. A. Guess	5	.....	5	.....
D. Guggenheim	....	100	.....	100
Isaac Guggenheim	1	.....	123	.....
Murry Guggenheim	100	.....	.....	1,500
Simon Guggenheim	500	.....	100	.....
F. W. Hills	132	16	132	16
William Loeb, Jr	....	100	.....	10
W. S. McCornick	....	1	.....	1
W. E. Merris	....	.....	.....	8
W. S. Morse	10	.....	10	.....
Walter T. Page	500	.....	600	.....
H. A. Prosser	10	100	10	.....
E. R. Raiff	....	.....	.....	5
E. R. Reets	.....	.....	.....	12
C. A. H. deSaulles	100	.....	100	.....
E. B. Schley	....	100	.....	100
John N. Steele	....	5	.....	205
Roger W. Straus	1	.....	1	.....
Mrs. Roger W. Straus	....	.....	74	.....
H. R. Wagner	....	.....	.....	200
C. W. Whitley (Dorothy)	10	.....	.....	.....
C. W. Whitley	....	.....	10	.....
Total held by directors	6,489	1,279	6,380	2,629

Out of a total of 500,000 preferred and 610,000 common.

Copper and Silver Producers Should Shut Down, Says Charles Butters

Maintains in Letter to E. P. Earle Drastic Action Will Bring Readjustment More Quickly

The following letter has been sent by Charles Butters to E. P. Earle, president of the Nipissing Mining Co., of Ontario:

"My dear Mr. Earle:

"Shall we run or shall we close down? Every copper and silver mining company in the world today is asking itself this question. Every board of directors and every manager is debating whether or not it is best to go on. I have had this question up with our mines for the last six weeks. At the mines they naturally feel that if they can keep on going without a loss or without too much loss it is better to keep running, because they are keeping their organization together. From the point of view of the people employed at the mine and the mercantile community whose life depends upon the running of the mine so long as the mine keeps running everything is all right; but from the owner's point of view things look very different. His capital is invested in the mine, and although the mine can be kept running and paying expenses he sees no interest return on his capital, and meanwhile his ore reserves are being steadily depleted.

"I think it is far better to keep the ore in the mine than it is to go on and knock the price of silver by producing on such a market as we have at the present time. Selling conditions are in no way bettered by the production of copper or silver at the present time. I cannot see the object of increasing the supply of metal, even if the supply is withheld, in the face of such an extremely light demand. It will be very difficult to get the price back on silver if we let it sink to 50c. or 60c., which it can do with perfect ease if we keep on producing in the face of no demand, because every time we offer we get a little less. If we are going to have low-price silver in the future the quicker we stop and wait for cheaper supplies and for labor to readjust itself the better off we are. We are all standing in our own light producing silver on the down-grade. It isn't as if we were producing clothing, food or any necessity. We are doing no public service. On the contrary, we are hurting the whole of the Chinese and the Indian market and reducing their ability to buy by making our offerings of fresh silver in the face of the low demand. Instead of benefiting the world we are hurting hundreds of millions of people by trying to force silver on a market already surfeited and unable to absorb the smallest amount without lowering the price.

"I urge every silver and copper mining company to close down definitely for either six months or a year, making a definite period in which they will not reopen and staying closed even longer if it is necessary. I know this is a hard thing for any mine to do, but I feel that we all ought to face it, and the more of us who face it together the quicker readjustment will take place.

"Sincerely yours,
"CHARLES BUTTERS."

Wages Cut at Butte

Miners To Receive Dollar Less per Day; Craftsmen's Wages 50 to 75c. Lower—9,500 Men Affected

Mining companies in the Butte district, Montana, announced on Dec. 16 that miners' wages will be reduced from $5.75 to $4.75 per day. The various craftsmen employed by the companies will receive from 50c. to 75c. less per day than they have been getting. The unions have received a thirty-day notice of the termination of existing contracts. In all about 9,500 men at Butte, Anaconda and Great Falls are affected. According to the operators this reduction was decided upon as an alternative to shutting down the mining industry in Montana altogether.

Copper mining is at the lowest ebb in a number of years in the Butte district. It is stated in producing circles that a sufficient number of inquiries as to copper have been received within the last year to give hope for the future. The Anaconda company is now operating upon a 40 per cent basis and it is hinted that a further reduction to 25 per cent is not unlikely, unless there is an immediate improvement in the outlook. The company now apparently has in mind a minimum of operation consistent with the maintenance of its organization. The present wage scale, it is pointed out, is one predicated upon a rise in the price of copper, but the schedule does not take into reckoning a possible drop in price. Instead the scale is pegged at $5.75.

It must be said to the credit of the Butte companies that a far more drastic curtailment could have been put into effect months ago, but in the hope that the copper situation might show an improvement, development and repair work has been carried on. Incidentally, this program has put the mines of the Anaconda in excellent shape.

Wages Cut by Arizona Copper Companies

Practically all the copper mining companies of Arizona have made reduction of wages on an average of $1 a day per man, with 20 per cent reduction on the office and supervisory salary accounts. The only declared opposition was at Globe, soon stilled by suggestion that the only alternative was the closing of the mines and works. Miners will continue to receive over $5 a day for about seven hours net work. The new adjustment has been somewhat different in such low-grade concentrating camps as Clifton, Morenci, Ray and Ajo, where the labor largely is Mexican.

Miners' Wages Cut in Missouri

From 9 to 20 Per Cent Less in Lead Belt—Decrease $1 Per Day in Joplin District

With the severe shrinkage from 10c. to 5c. per lb. in the price of lead in four months the operators in the lead belt of southeast Missouri have notified the miners that after Jan. 1 there will be a cut of 20 per cent in the wages of all men receiving over $4 a day and 9 per cent for those receiving under $4, with a minimum of wage of $3.

In the Joplin zinc district a horizontal cut of $1 per day has been made.

Apache Powder Co. Erecting Acid Plant at Douglas Smelter

A fuming acid plant is to be erected at the Calumet & Arizona smelter at Douglas, Ariz., by the Apache Powder Co., which is building a large explosives plant at Land Station in the San Pedro Valley, seven miles south of Benson, Ariz. The local plant, which will not be of large size, will be entirely distinct from the large Calumet & Arizona sulphuric acid works, which now supply the acid used in the leaching operations of the New Cornelia company at Ajo. For the making of powder there will be required a relatively high grade of acid.

Arizona's Income From Mines To Be Less This Year

Following the approaching tax assessment, it is expected that the average Arizona taxpayer will have better appreciation of the part the mines of Arizona have in support of the rather expensive state government. Mining tax assessments are based upon the average mine production for a period of five years, this period set to equalize any fluctuation in the value of the product. For a number of years copper has been high, with its peak price reached during the early period of the war. But for two years, and especially during 1920, the mine profits have been low, or have been non-existent. At the time of the last assessment the drop of value and of product had its effect upon the five-year average, and the gross mine tax assessment went down $24,000,000 in Arizona. At that, the mines paid on a valuation of $454,000,000 in a total state assessment of $884,000,000. When the coming assessment is made with two lean years figured in with the three good years, the drop in the mine assessment may reach 15 per cent additional. Naturally, to keep up the same state income there must be a material increase in the tax rate, with possibly 60 per cent collected from the assessment on city property, farm lands, live stock and general industry, including railroads. The state has an official organization on a broad scale, with equipment of offices and commissions that probably would serve for the administration of thrice its population of 330,000.

German Iron Prices To Go Lower

Effect of November Cut Disappointing —Buyers Holding Off—Dealers Forestalling Foreign Bids

Vienna, Nov. 19—The expectation that the average decrease of 400 marks per tonne in German prices for iron, which went into effect Nov. 1, would bring greater activity in sales has not been realized. When it became known in October that the companies proposed to make a further reduction in prices, the consumers cancelled a very considerable amount of ordered materials in order to be able to take advantage of the anticipated lower prices. On the other hand, the works insisted that materials ordered be accepted and paid for at the contract prices, so that considerable material was delivered. The uncertainty of the whole economic situation is causing consumers to hold back. Purchases indicate the immediate needs, because most buyers are not stocking up. Relying on the present ability of the plants to make prompt deliveries and encouraged by the whole state of the market, consumers feel that there is and will be no lack of iron and that they need not buy for future needs. Since the price cut did not bring the hoped-for results consumers are already counting on a further cut by Jan. 1, and accordingly are buying very cautiously. Uniform prices have wholly disappeared from the market. Both works and dealers are very accommodating to customers, for it is feared that as the foreign exchange falls, the foreign iron markets that are also suffering somewhat will cut in on German markets more strongly. Therefore discounts from official minimum prices are readily allowed when one can thereby secure larger orders for early delivery.

Broken Hill Miners Resume Work

Melbourne, Nov. 22—After a struggle lasting over eighteen months, the Broken Hill mines in Western Australia have been reopened, and work has been resumed under the terms of the award made by the tribunal over which Justice Edmunds presided. Since the reopening of the mines, engineers, carpenters, joiners, and boilermakers have applied for a reduction of hours similar to that awarded to miners. The companies have therefore offered the unions concerned a 43-hour week, on the understanding that the fortnight's holiday yearly on full pay, as previously arranged, would not obtain under this arrangement.

Arizona Chapter of Mining Congress Elects Officers

Robert E. Tally, of the United Verde Copper Co. at Jerome, Ariz., has been elected governor of the Arizona Chapter of the American Mining Congress. The vice-governors are T. H. O'Brien, of Globe; G. M. Colvocoresses, of Humboldt, and John C. Greenway, of Warren. J. E. Curry, of Bisbee, is retained as secretary and H. J. McClung, of Phoenix, as treasurer.

Norwegian Nickel Company Seeking Loan

It is stated in the Norwegian press that Minister Sam Eyde and Captain D. Vogt left Norway recently for London to confer with the British interests in the British America Nickel Corporation, operating in the Sudbury district of Ontario, on behalf of A. S. Kristiansands Nickel Raffinerings Verk. The object of the conference is assumed to be the securing, through the medium of the board of trade, of a favorable loan. As previously referred to in the *Engineering and Mining Journal* of Feb. 7, 1920, the Norwegian company is strongly interested in the Canadian undertaking at Nickelton, Ont., its shares in the latter being book entered at over 16,500,000 kroner.

Pessimistic as to Swedish Iron Industry's Future

A Swedish engineer, A. Walberg, is by no means optimistic in his views on the future of Sweden's iron industry. In a statement, reproduced in the Swedish press, he points out that foreign competition in the near future will be very severe and even in the internal market foreign wares will compete with advantage with Swedish iron and steel. The enormous increase in fuel costs will burden the Swedish industry far more than that of foreign competitors who would reap additional advantage from the existing conditions of exchange values. So far as export conditions are concerned the position is far worse. During the war a large number of those consumers who had previously used Swedish pig iron and steel were compelled to resort to their own country's products. At first these home products were considerably inferior in quality to pre-war Swedish goods, but as the war progressed the quality (especially in the electric refining branches) improved in a very high degree. These disabilities, quite apart from the depression prevailing in all quarters, will make it especially difficult for the Swedish iron industry to recapture the old export market that it formerly had.

Old Copper Mines in Norway Close Down

The ancient copper mines of Röros, Norway, have recently been closed down, and will probably not be operated again until the period for the compulsory increase in wages fixed by the Arbitration Court expires in 1922. The reasons given by the press for this step are the increase above referred to and the steadily rising cost of all working materials. The Röros Mines were opened on Aug. 28, 1644, and have been in continuous operation ever since. They comprise the three chief mines of Storvarts, Kongen, and Muggruben, and five auxiliary workings. The output from 1644 to 1911 is stated at about 80,000 tons of copper and 400,000 tons of export pyrites.

New Idria Receiver Asked

Friendly Suit Brought To Preserve Assets Until Re-financing Plan Can Be Worked Out

Application has been made for the appointment of a receiver for the New Idria Quicksilver Mining Co., of California, in order to preserve the company's assets and property until some plan of re-financing can be formulated and carried out. In a circular to stockholders president Andrew Adie says that the suit instituted for this purpose is a friendly one with the company consenting. The causes of the present condition of the company's finances are: Excess cost, overestimates of rebuilding the company's plant after the fire of last June; the loss of production during reconstruction; and the decreased price of quicksilver caused by dumping of surplus war stocks on the market.

Katanga To Try Pulverized Coal in Blast Furnaces

Arrangements have been made by the Union Minière du Haut-Katanga, operating in the Belgian Congo, with the Garred-Cavers Corporation, of New York, for the use of the latter's process, whereby pulverized coal is used to replace coke in blast furnaces. The Katanga company has placed orders for a 42-in. Fuller mill and a Fuller-Kenyon pump for the coal preparation plant which will be used in connection with the process at its copper smelter.

Licenses were secured from the Garred-Cavers Corporation some time ago by the Cerro de Pasco Copper Corporation, the International Nickel Co., and the Tennessee Copper Co., for the use of this process at their various smelters.

Recent Production Reports

Cie. du Boleo, Baja California, produced 771,680 lb. copper in November as against 617,120 in October.

Calumet & Hecla produced 7,326,763 lb. copper in November compared with 7,943,502 in October. November's output by subsidiaries was as follows: Ahmeek, 1,840,600; Allouez, nothing; C. & H., 4,227,099; Centennial, nothing; Isle Royale, 768,684; La Salle, 22,700; Osceola, 436,280; Superior, nothing; Tamarack, nothing; and White Pine, 31,400.

Greene-Cananea produced 3,350,000 lb. copper in November, the same as in October.

East Butte produced 1,658,860 lb. copper in November, as against 1,626,980 in October.

Chile Copper produced 8,859,984 lb. copper in November, compared with 9,420,000 in October.

The Rand's gold output for November was £2,740,250, compared with £2,813,500 in October.

The output of silver from the Kongsberg mines in Norway for October was 1,408 kg. with an addition of 134 kg. of coarse silver from the Gabe Gottes workings.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Assessment Work Compromise Accepted by Both Houses

House Votes in Favor of Senate Bill for Six Months' Grace for Claim Holders

After some discussion but without the necessity for a rollcall, the House of Representatives passed the measure already approved by the Senate for extending the period for doing assessment work on mining claims until July 1, 1921. There was some objection to the measure on the ground that it had been stated when the assessment work was suspended for 1919 that no further requests of that character would be made. It was pointed out, however, that while individual members of Congress had made such statements, the owners of mining claims faced much more difficult conditions than in 1919. Instances were cited where labor was absolutely unprocurable. During the discussion of the measure it was intimated that prior to July 1, further legislation would be asked extending still further the period for doing the 1920 assessment work. It was stated that the snow does not leave the mountains in many areas until the middle of June, leaving insufficient time to complete the work prior to July 1. Owing to the shortness of the time available, the bill had to be passed in exactly the same language as that contained in the Senate bill. The President is expected to sign the bill promptly.

In a letter to Representative Rhodes Secretary Payne said:

"House joint resolution 396 is similar in language to the act of November 13, 1919, and would extend relief to mining claims in the United States, including Alaska. I recommend that this or similar legislation be adopted."

Sentiment in the Senate, however, was strongly opposed to further relief from assessment work, despite the fact that most of the members from mining states were in favor of its being excused in 1920. The majority, however, was against any such proposal, but there was no objection to extending the time for performing this work.

Provides Tariff on Imports of Asbestos Manufactures

In a bill introduced in the House of Representatives by Representative Watson of Pennsylvania provision is made for high import duties on the manufactures of asbestos. The bill provides that unmanufactured asbestos is to be admitted free of duty.

Although emergency tariff legislation probably will be enacted at this session of Congress placing high import duties on several agricultural products, live stock and wool, there is little chance that the list will be extended to include any of the minerals. It is very doubtful if the dyestuffs bill can be passed at this session. This means that the various tariff measures on minerals which are now before the Senate are likely to wait for general traff revision that will take place at the extra session which will probably be called.

Means Appointed Chief Engineer of War Minerals Commission

Secretary Payne has appointed John H. Means to be chief engineer of the War Minerals Relief Commission. Mr. Means has been acting in this capacity since W. R. Crane resigned.

Awards totaling $8,924.45 were recommended by the War Minerals Relief Commission during the week ended Dec. 11. The awards were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amcunt claimed are shown): Liberty Mining Co., chrome, $3,352.25, 41 per cent; Atlantic Manganese Co., manganese, $3,309.64, 15 per cent; W. Michelini, chrome and manganese, $2,182.54, 43 per cent.

George Otis Smith Defines Noble Minerals

Speaking at a recent meeting of the Portland Cement Association Dr. George Otis Smith, the director of the U. S. Geological Survey, said:

"We are apt not to pay enough honor to the humble but useful things of life. The dominant position of our country in a world of industry and commerce is due largely to our wealth in the essential minerals, and the statistical record of the growth of our mineral industry shows how the baser metals have taken the leadership from gold and silver. Indeed the non-metals, once of subordinate rank, now far exceed the metals in value of annual output. To make a more specific comparison, the three building materials, cement, stone and clay products, reached last year an output valued at $500,000,000 and exceeded the total value of all the metals except iron. The annual output of your own product, cement, exceeds in value that of any two of the metals except iron and copper. The noble minerals of today are the mineral fuels, the metals, iron and copper and the structural materials. Upon these the daily life of our industries depends."

Brass cartridge cases to the extent of 56,250,000 lb. are to be sold by the Director of Sales. Bids are to be received until noon Jan. 5.

Process for Making Phosphoric Acid Improved

Bureau of Soils Has Devised Method Involving Briquetting and Smelting —Cottrell Plant Used

After comprehensive experiments officials of the Bureau of Soils are convinced that a method has been devised which offers advantages over the present process for extracting phosphoric acid from phosphate rock. The rock is briquetted with sand and coke and smelted in a fuel-fed furnace. In addition to the laboratory work which has been done the method has been tested on a commercial scale at a plant built for the purpose by the Bureau.

Since it has been possible to make in a small plant a product which could be sold in competition with the product of the large plants using the sulphuric acid process, it is regarded as practically certain that a large scale plant could make even a better showing. The development not only means cheaper fertilizer, it is believed, but will make possible the extension of the life of the rapidly diminishing phosphate deposits. In handling the Florida material by the old method one of the most troublesome impurities is the clay. This clay is particularly gluey in character. Advantage has been taken of this property, which forms a splendid binder for the briquettes. Due to the difficulties of keeping the fuel in direct contact with loose material, results of an encouraging nature were not obtained until the briquetting plan was worked out. Sufficient sand to furnish the required silica also occurs in the deposits as an impurity. The only needed materials which are not right at hand are coke and fuel oil, but the Florida phosphate deposits are splendidly situated in regard to those materials. Coke is made in large quantities in the Alabama coal fields, and fuel oil may be brought directly across the Gulf from the Mexican oil fields. Under the present methods of handling phosphate rock elaborate screening and washing must be done to separate the rock from the impurities. This led to the waste of some two-thirds of the rock. In the experimental runs the Bureau of Soils chemists were able to recover a 64 per cent phosphoric acid, which is equal to 47 per cent P_2O_5.

It is predicted at the department that the new method will revolutionize the fertilizer trade. It is possible that it will have a decided bearing on the plans of Western smelters to ship superphosphate into the Middle West.

The work on this problem was begun by the Bureau of Soils five years ago under the direction of Dr. W. H. Ross.

His experiments were confined almost entirely to the use of the electric furnace and the Cottrell precipitator. Dr. Ross succeeded in getting a very concentrated product, but the costs were considerably higher than those of the sulphuric acid process. J. N. Carrothers, one of the bureau's electrochemists, continued the work begun by Dr. Ross and in co-operation with the R. B. Davis Co. experimented on a semi-commercial scale. He reduced costs to the point where they were almost identical with the sulphuric acid method, but the general conclusion was reached that the electric furnace could not be used except in cases where an exceptional high-grade product is required.

Early in 1918 W. H. Waggaman was placed in charge of the work and began experiments with fuel instead of the electric arc. Many obstacles had to be overcome, some of which had to do with furnace construction. Finally a sort of combined blast and open-hearth furnace was devised. By using fuel oil and the briquetting process it soon became evident that the major problem was solved. There still remain some mechanical details which must be worked out. Complete success of the process is anticipated.

NEWS BY MINING DISTRICTS

Special London Letter

Public's Lack of Confidence Makes Financing Difficult—Santa Gertrudis' Notes at Discount—Little Mine Development Reported

BY W. A. DOMAN

London, Dec. 7—In these days when the financial position has got upon people's nerves, confidence in the immediate future seems to have received a nasty blow. Perhaps it is not to be wondered at. Deflation and the consequent fall in commodity prices are making themselves felt. Trouble is reported in the produce markets, and in the various trade directions; metals have tumbled to an alarming extent, and there is talk of assistance having to be given to firms in Mincing Lane, Liverpool, and, it is whispered, the Stock Exchange. With tin below £209, a drop of something like £59 in a month; with lead at about £25 10s., copper at £77 10s., and spelter under £30, base-metal companies are experiencing a drab time. Investors are selling in all directions, and mining shares cannot exempt themselves from the influence. Fortunately tin, copper, and lead companies never reckon upon a stable price for the metal, so that there is always a margin; the position at the moment, however, is far from pleasant. Gold has fallen to 117/1d. per oz. and silver to 46⅛d., so that the whole gamut of mining descriptions is affected. From the standpoint of mining operations no one cares to take a lead, partly because of the virtual impossibility of doing so. Where so many companies need money, and where the demand for their products has fallen off, the public cannot be induced even with big baits to assist at the moment. Sound as the notes offered by the Santa Gertrudis were regarded as being, the times are unpropitious, and subscriptions did not roll in as they would have done normally. Yesterday for the first time dealings took place, and it was a disappointment to all to find that the notes were quoted at £10 discount. Not a satisfactory beginning by any means. But Santa Gertrudis is not solus in this respect. Large industrial corporations that will live long after Santa Gertrudis is wound up have the mortification of seeing their notes, even better secured, knocking about at a discount. Companies must have money, it is true, if their operations are to be continued. The Buena Tierra, a Mexican undertaking, is asking for £66,000 in five-year notes, carrying 10 per cent interest cumulative, and redeemable with a bonus of 25 per cent. This offer is at the rate of one note to every five shares held. The notes have a prior lien on all the profits, and as the issue is small, the security, though it cannot be divorced from the speculative, is nevertheless of its kind quite good, and the management and the 25 per cent bonus would get the money readily ordinarily. Some of the American mining companies directed from this side have in the past proved very successful in financing on some such lines.

Strangely enough—or perhaps it is not strange — new mining companies report much in the way of developments in these days. It is so noticeable that after a spell of dullness quite a number of companies find something to announce, and as sometimes from 50 to 100 ft. of driving are mentioned it is pretty obvious that the news has been saved up.

If emphasis were needed upon the parlous condition of many of the gold mines on the Witwatersrand it could be found in the speech of Lord Harris at the annual meeting of the Consolidated Gold Fields. This finance company has the misfortune to be interested in several mining areas where nature has been rather parsimonious in distributing the gold. No one can blame the company, for the claims were acquired when the belief obtained that the deep levels of the Rand would prove as profitable as the outcrops, and when boring at great depths had indicated the continuity of the Main Reef series of reefs. The metallic content, however, is so low that there would be no surplus of revenue over expenditure were it not for the existence of the gold premium. Recognizing that the prospects are far from hopeful so far as the Central Rand is concerned, the Gold Fields has altered its constitution somewhat and will in future pay greater attention to industrial enterprises. It has already invested fairly substantial sums in South Africa, in England and in America, as regards the last named in power undertakings and the American Trona Corporation. Several of these, especially in South Africa, have yet to be developed, but the change is a sign of the times.

During the war all South African mining shares held by enemies were placed in the hands of either the Public Trustee in this country or with the Custodian of Enemy Property in South Africa. Some of the mining and finance companies have purchased such holdings and issued them at low rates to the other shareholders. There are still remaining, however, shares to the value of about £6,000,000, mainly held in South Africa, which the two officials mentioned are endeavoring to realize. The finance corporations here would be only too pleased to take the shares but there seems to be considerable difficulty in coming to an arrangement.

A Rhodesian mine, the Lonely Reef, in which Rothschilds were interested in a way at its inception, has more than borne out the estimates then made. It is one of the brilliant exceptions of the country, and although it has been in existence ten years its ore reserves at September 30, just announced, stood at 207,912 tons of an average assay value of 21.39 dwt. Three months earlier the quantity was 198,341 tons and the value 22.2 dwt. Not many mines can maintain an average exceeding an ounce. There is another, the Globe & Phoenix, which has more than surprised its management. What seems like a new reef has been discovered at the 14th level and capital values are shown, i.e., 51 dwt. over a stoping width. In the 15th level the first assays exceed 5 oz. over a stoping width. The interesting problem at the moment is whether this reef will junction with one previously worked.

AUSTRALIA

Queensland Government Secures Yampi Sound Iron Ore

From Our Special Correspondent

Brisbane, Nov. 5—Notwithstanding that London financiers turned down the State Premier's request for a loan, a part of which was for establishing a

government iron and steel works, the Minister for Mines has just stated that it is intended to go on with the enterprise, and with this end in view to buy the large and rich iron ore deposit at Yampi Sound that has been under offer for the past four months. This iron and steel works project is, on account of its magnitude, mixed up with the political situation of Queensland more prominently than any other state schemes which the present government has in hand. When the British refused the loan it was decided by the Queensland government to appeal to the country to show that the people approved of its policy, and the result of a general election which was brought about six months before the term of the old parliament would otherwise have expired is that the government has come back to power with a small (and very much reduced) majority of members, but with a considerable majority of the people as a whole against them if all the other parties in the new House are numbered against them. The government now announce that they are going to carry on, and that they intend to get the money for the proposed iron and steel works at Bowen as well as for other purposes. As a matter of fact they have closed with the Yampi Sound iron ore deal and are paying the £30,000 which is the price in debentures. A sum of £3,000 had previously been paid for the option to purchase.

The ore deposit is on Cockatoo Island, belonging to Western Australia, on the northwestern coast of the continent, 250 miles north of Broome, 1,500 miles from Perth, W. A., and nearly 2,000 miles by sea from the port of Bowen, Q., on the east coast. The Minister for Mines describes the deposit as one of the best if not the very best in the world, and it certainly is a good one. Borings carried out by the Queensland government show that the ore contains 69.6 per cent of metallic iron, with only 0.1 per cent of silica, 0.1 per cent phosphorus and 0.005 per cent sulphur. The quantity of ore on the island has been officially estimated at 20,750,000 tons above sea level, with an unknown quantity below the level and large supplies that have been shed into the deep water of the foreshore from its precipitous slopes.

The principal Queensland iron ore deposits are in the Cloncurry district, 600 miles by rail from Bowen. This ore runs only 50 per cent metallic iron, and, as it is high in silica, it is proposed to blend it with the Yampi Sound ore in the manufacture of iron and steel at Bowen.

The coal for these works is to come by rail from the Bowen River, 60 miles inland. From this coalfield an almost unlimited supply of good coal will be available as soon as the railway to that place is finished, probably in twelve or fifteen months. In addition to the State colliery three coal leases are being opened up by a private company, and it is officially estimated, as the result of extensive borings, that when the two mines are properly developed they will be capable of producing a million tons of first-rate coking coal per annum for over a hundred years, and that in addition to meeting the bunker requirements of oversea steamers calling at Bowen they will very soon be able to supply the needs of the whole of North Queensland at a reduction of 33 per cent in price compared with that paid for coal at present obtained from the south.

The only large iron and steel works at present in Australia are those of the Broken Hill Proprietary Co. at Newcastle, and these are doing so well that it is intended to add to the existing plant at once. These works are supplied with iron ore from South Australia, and this ore, which runs 61.70 per cent iron, has to be conveyed 35 miles by rail and about 1,300 miles by water. On the other hand, the coal used at the works is mined right on the spot at Newcastle, and the climatic conditions are all in their favor as compared with Bowen, which is within the tropics.

CANADA

British Columbia

Labor Abundant in Kootenays—Consolidated M. & S. Co. Refuses Custom Ore Unless Shipper Can Finance Marketing Bullion

Nelson—Abundant labor is now available for mining operations throughout the Kootenays, and in some cases a surplus even in the more skilled lines in contradistinction to the condition prevailing a few weeks ago. This change has been brought about largely through depression in the lumbering industry, releasing hundreds of men formerly employed in the woods, and by an influx of miners from across the line, who have been laid off. The One Big Union strike, which practically paralyzed the Slocan silver-lead mining industry during last summer and fall, is in consequence at an end.

Silversmith Mines, Ltd., operating the Silversmith mine (formerly the Slocan Star) at Sandon, B. C., has declared a dividend of 1c. per share. This will be the only dividend paid by Slocan companies during 1920. Silversmith, a silver-lead property, appears to be the only Slocan property in a position to operate profitably under present conditions.

The Blue Bell mine of the New Canadian Metal Co. on Kootenay Lake and scene of the earliest lode mining operations in this section continues operations, but with a reduced force, preference in employment being given, it is stated, to men with families who have been with the company for several years.

Complaint by the Associated Boards of Trade of Eastern British Columbia that charges for coal and coke used in smelting operations are excessive is resulting in an inquiry being made into costs of production and distribution of Crow's Nest Pass coal and coke products.

A further curtailment in Kootenay mineral production must inevitably follow notice served on shippers by the Consolidated Mining & Smelting Co. of Canada, Ltd., that no custom ore can be taken care of until further notice unless shippers are in a position to finance the carrying or marketing of the bullion themselves.

The Consolidated M. & S. Co. has sharply curtailed all new construction operations around the Trail smelter, following banking advices that no additional advances on metal stocks on hand or accumulating could be looked for. It is stated that following the curtailment order men employed on purely constructive work were laid off to the number of about 300 or 400. This may be taken to indicate that construction of the proposed concentrator, designed for handling lower grade Rossland ores, will be inevitably postponed for several months at least.

Victoria—Reference has been made to the incorporation of the Coast Range Steel, Ltd., an organization said to be backed by British capital to the extent of $15,000,000 and whose plans are to establish in British Columbia an iron and steel industry capable of taking care of all the requirements of northwestern America and as well of securing a large share of the foreign transpacific trade. It was said, too, that another British syndicate has had its engineers in the field in British Columbia investigating its natural resources with a view to starting a similar enterprise. A third announcement has been made in this connection which is of interest. It is that the Industrial Department of the provincial government has undertaken to loan $250,000 to finance the amalgamation of the Port Moody, Eburne and Tudhope electric plants, the new company to be known as the B. C. Steel Works, Ltd. No official confirmation, however, is available of the assistance said to be promised by the government.

Britannia Beach—The Britannia M. & S. Co. has shut down its mill and ceased shipments owing to the condition of the copper market. Mine development is being continued. The July, 1919, schedule of wages is again in force.

Ontario

Power Outlook Improving—Kerr Lake To Stop Production

Cobalt—The outlook as regards the supply of electric power is becoming more favorable, owing to increased rainfall and the continuance of open weather causing a rise in the level of the lakes and river.

It has been decided to discontinue production at the Kerr Lake mine for the present, but as many men as possible will be retained and employed in development work. Operations at the Dominion Reduction plant, which was running chiefly on ore from the Kerr Lake, will be considerably curtailed.

Porcupine—Development work on the Clifton Porcupine has been suspended. A circular issued to the share-

holders states that under the financial conditions prevailing during the last few months it has been found impossible to dispose of treasury stock in sufficient quantity to provide funds needed to carry on development on an adequate basis. It was therefore thought advisable to conserve the funds now in the treasury until such time as it is found expedient to resume work. The results of the work so far done give reason to believe that the property can be made a profitable producer and it is intended to seize on the first favorable opportunity to complete the financing of the company and proceed with development.

At the McIntyre the new vein system lying about 400 ft. south of the No. 5 shaft has been opened for about 225 ft. on the 1,375 level with highly favorable results, the vein showing a width of 20 ft., with gold content stated to average higher than in the main vein system.

Boston Creek—A find of almost pure chalcopyrite has been made in the west crosscut at the 500-ft. level of the Miller Independence. It occurs in the form of a small solid vein lying alongside a vein of calcite. Assays in bulk show 32.48 per cent copper, with $2.80 in gold and 1.3 oz. silver per ton. A copper-bearing vein on the surface has been traced for a considerable distance, assays from which seldom exceeded 3 and 4 per cent, indicating that mineralization is increasing at depth.

Gowganda—At the Trethewey property the drift on the "office" vein is in over 100 ft. with high grade showing all the way. A shipment of high-grade ore is being prepared.

The Miller Lake-O'Brien with a production of 708,872 oz. last year paid taxes on profits of $451,000.

NICARAGUA

Nicaragua Mining Co. Near Profit-Earning Stage After Nine Months' Work

Pis Pis District—The Nicaragua Mining Co. has developed between $500,000 and $1,000,000 worth of ore averaging about $22 per ton at the Neptune mines. A large tonnage of manta and disintegrated vein rock running $3 to $14 per ton has also been located. Operation of the first 3-stamp unit of the amalgamating mill was begun on Nov. 1. A $4 per ton profit is estimated with $12 mill heads and 60 per cent recovery. It is expected that the mill will be handling 100 tons daily this month. With nine stamps dropping the capacity, it is figured, will be 120 tons per day and the profit at least $10,000 per month. Barry Searle, consulting engineer and general manager, finds that the Neptune vein contains three paystreaks, one along the footwall, one along the hanging and one in between. These chutes in places come together to form a pay chute 35 ft. wide averaging better than $15. As developed thus far these chutes have an estimated length of 450 ft. with faces still in pay ore. Granville S. Borden has been appointed general superintendent in place of William B. Daniel, resigned.

The Eden Mines tunnel toward the Hidden Treasure vein is showing good stringers of ore which do not appear on the surface. The company hopes to cut the Hidden Treasure vein about Jan. 1.

MEXICO

Coahuila

Torreon Smelter Down Until Spring

Torreon—Persons arriving here from the Mapimi camp report that the smelter of the Penoles company and the Penoles mines have been closed down. The miners and outside laborers have been discharged and many of them are leaving with their families. A few of the Americans, heads of departments, are being retained in camp. Others have been sent to Monterrey or Aguascalientes.

The smelter at Torreon remains idle and the management does not anticipate the resumption of work until after March. They have notified all shippers that no more ores will be received until further notice.

Rafael Bustamante, a prominent rancher of this district, has filed on the vacant ground contiguous to the famous Buena Ventura and Cuatro de Julio mines in the Velardeña mining district. The A. S. & R. is still operating its smelter in this camp here.

Saltillo—Local mining men of this city are opening up some promising veins of lead and zinc ores in the Jaquez de Ferniza mountains near by. Their group of mines is composed of 26 pertenencias which are being thoroughly prospected and developed.

The Esperanza and Placeres mining companies with headquarters in this city have called for a general meeting of stockholders to be held the latter part of this month, at which time assessments will be levied in order to carry on development work until ore shipments can be resumed.

Guanajuato

New Ore Found at Melladito Group

La Luz.—Development work is being carried on in the Melladito Group of mines of the United Mines Co. This work has resulted in the finding of a new body of good milling ore. The company's 15-stamp mill at this property was shut down about a month ago and will remain down until conditions warrant a resumption of operations. Joseph MacDonald, Jr., is superintendent in charge of mines.

ARIZONA

Copper Queen and C. & A. To Cut Wages Jan. 1—May Resume Operations at Hardshell

Bisbee—The Arizona Bisbee Copper Co. has suspended operations indefinitely.

The Copper Queen and the Calumet & Arizona have posted notices advising a cut in wages effective Jan. 1, 1921. For all employees whose wages are $5.35 and above the reduction is $1 per day. For those receiving less than this amount the reduction is 80c. per day. For all salaried men there is a reduction of 20 per cent on the base rate of pay. The service bonus is to be discontinued.

The Shattuck mine and mill have been closed down. About 40 men are still retained at the mine to do the necessary repair work and continue some development work.

The Wolverine & Arizona are not now shipping. A few men have been retained doing some development on the 300 level.

Courtland—Shipments of ore have been discontinued at the Great Western Copper Co.'s property, at Courtland.

Patagonia—H. K. Welch is on his way to Patagonia from New York. Upon his return it is reported operations will be resumed at the Hardshell mine, of which he is general manager. The new shaft will be unwatered and the drift continued on the 500 level until it cuts the orebody. Operations have been suspended since last May.

The Mowry mine has resumed shipping lead-silver ore to the El Paso smelter.

The present campaign of diamond drilling has been completed at the Three R mine. Neither the future plans or the results of the diamond drilling have been announced. The property belongs to Magma Copper interests. Representatives of the Three R have been examining the Blue Nose mine.

Fred Kohlberg and C. C. Allen have taken a lease on the Flux mine and are milling lead carbonate ore. Several shipments of concentrates have been made recently.

Work in the tunnel of the Andes mine, which belongs to R. R. Richardson, is progressing and has now reached a point where the vein cut by higher workings is expected.

The Grey Brothers are doing some exploration work in the tunnel in which they encountered grey copper ore recently.

Duquesne—At the Duquesne and Washington camps owing to the slump in the price of copper most of the mines and leases have been shut down. Some lead-silver ore is still being shipped, which is mostly produced at the Kansas mine.

At Rosemont in the Santa Rita Mountains all mines are idle, operations having been suspended recently.

Silverbell—In its report for November, the management of El Tiro Leasing Co. will submit plans for financing an extensive development campaign during the period of market depression. Salaried employees have voluntarily accepted a 20-per cent cut in salaries.

Chloride—George N. MacBean, a Holbrook druggist, has been made receiver for the Tennessee and Schuylkill

mining interests of Chloride, in a hearing of corporation troubles lately held at Holbrook, before Superior Judge J. E. Crosby. Application had been made by Frank A. Garbutt, of Los Angeles, for foreclosure of a $300,000 mortgage held by him on the property, which, according to statement in court, has a value approximating $10,000,000. The application was denied, with some reference to the fact that Garbutt, while sole manager, had failed to make the mines pay. The receivership was asked by Charles A. Burke and associates, who have taken over the Garbutt mortgage. Announcement was made that production would be resumed soon at the mines, which have been the main support of Chloride, shipping silver-lead ores.

Jerome—The stockholders' fight has been suspended within the Jerome Superior Copper Co. till after the Arizona State Corporation Commission has investigated the books of the company. The bulk of the stock is held in Los Angeles, where allegations of mismanagement were made against Manager George Mitchell and President M. P. Frazier.

NEW MEXICO

Operations in Lordsburg District

Lordsburg—Shaft sinking is being continued at the Eighty-five mine. A station is being cut on the 1,050-ft. level. A sump, 10 x 10 x 28 ft., will be cut and an electric triplex pump installed with a capacity of 175 gal. per min., to pump direct to surface. Drifts are being carried both east and west on the vein on the 900-ft. level.

The Co-operative mine is sinking the main shaft at the rate of about 3 ft. per day.

Tyrone—A test run of the new cyanide mill on the Cora Miller mine has been completed with satisfactory results. Harry Wheeler, for many years with the Socorro Mines, at Mogollon, is mill foreman.

CALIFORNIA

Cyanide Installation at Juniper Mine Complete

Rough & Ready—It is reported here that the Old Black Bear mine, once owned by County Assessor Henry Schroeder and recently worked by Eastern interests, will be refinanced and operated under the name of the Kansas mine. William Buholz is promoting the deal. New equipment will be purchased if the transaction is consummated.

A. R. Archibald, of the same district, is at present in Omaha seeking to finance a company that will reopen the old Osceola mine.

Hayden Hill—Installation of the 40-ton cyanide plant and other machinery at the Juniper mine at Hayden Hill is now complete. Supplies for the winter's run are on the ground. The main shaft is down 386 ft. and still in pay ore. Two stopes have been cut and another will be started.

Sonora — Announcement has been made that Carson Hill Gold's new mill will be ready Jan. 15. The number of stamps dropping will be doubled and the mill capacity will thus be brought to 15,000 tons of ore monthly.

Amador City—The Bunker Hill company has resumed mining on the 1,750 and 2,800 levels. Sinking of the deep winze has been temporarily suspended but will be resumed when conditions are favorable.

NEVADA

Market Improved for Virginia Louise Ore—Nevada Con. Drills Into New Ore

Pioche—Virginia Louise stockholders met at Pioche on Dec. 20 to act upon a proposal to amend the articles of incorporation so as to permit an increase in the capital stock from 1,000,000 shares of $1 per value to 1,500,000 shares of the same par value. The principal reason for this is that the market for Virginia Louise fluxing ore has improved. From Sept. 10 to Nov. 15 the company had a market for only 75 tons daily delivered to the U. S. Smelting R. & M. Co. and the freight rate was 25 per cent higher than formerly. On Dec. 4 the old freight rate was restored. Additional contracts have also been made under which the A. S. & R. will take 100 tons daily and the International Smelting Co. from 50 to 250 tons daily. Shipments under this latter contract are to begin as soon as the requirements of the International demand it. Thus the company expects to be able to market about 400 tons daily. A larger hoist must be installed as well as better facilities for handling the ore between shaft and loading bins. New underground development is also planned.

Increase of the capitalization of the Prince Consolidated Mining & Smelting Co. was approved unanimously at the stockholders' special meeting held at Salt Lake City on Dec. 11, at which meeting a total of 850,000 shares out of 1,000,000 was represented.

An amendment to the articles of the company was passed providing for increasing the capital stock from 1,000,000 to 1,500,000 shares, and decreasing the par value of the stock from $2 to $1 per share. The 500,000 shares of capital stock increase is to be put in the treasury of the company.

Ore shipments from the Pioche district for the week ended Dec. 9 decreased, being 2,255 tons. Shipments were: Prince Consolidated, 1,110 tons; Virginia Louise, 855; Bristol Silver, 195; Black Metals, 45; and Combined Metals 50.

Ely—At the Ruth mine of the Nevada Consolidated, at a point about 600 ft. northeast of the Ruth shaft and 500 ft. from the orebody recently opened up, drilling has demonstrated a body of copper ore 150 ft. thick and considerably above the average in copper.

Both the Nevada Consolidated and the Consolidated Copper Mines have announced that no further reductions will be made in the working forces.

UTAH

Utah Apex Shuts Down—Utah Operators To Cut Wages

Wage decreases have been decided upon by Utah operators to go into effect Jan. 1. Silver-lead producers will make a cut of 75c. per day and copper producers a cut of $1.

Eureka—Ore shipments from the Tintic district for the week ended Dec. 10 amounted to 179 cars as compared with 199 cars the week before.

Park City—Shipments for the week ended Dec. 10 totaled 2,000 tons of ore and concentrates against 2,137 tons the week before.

Bingham Canyon—Utah Apex has suspended operations on account of market conditions.

COLORADO

Hidden Treasure Near Camp Bird Bought by Company Headed by Benedict Crowell

Ouray—The Hidden Treasure Mining Co., a new incorporation, of which Benedict Crowell is president, has purchased the Hidden Treasure property, located not far from the Camp Bird mine, from Mrs. Evelyn Walsh-McLean. The new company plans to advance the Hidden Treasure tunnel about 3,000 ft. and do considerable lateral development. Second-hand equipment has been purchased from the Silver Mountain Mining Co. at Ironton and will be moved to the Hidden Treasure property and installed as soon as possible. E. R. Bauer will be local superintendent.

Camp Bird has shut down indefinitely. This is the first time in years that the famous old mine has been absolutely idle. The reason given out was the high cost of operating. It is believed that the mine will resume work early in the spring.

Montezuma—The Bell mine, once a producer of high-grade silver ore, which has been idle for about 20 years, has been optioned to George H. Short, of Salt Lake City, who plans to organize a development company.

Leadville—Lessees who have been developing the Lillian property have opened a promising body of zinc ore, which assays 30 per cent to 35 per cent zinc. The tunnel has been advanced 400 ft. to a total distance of 700 ft. A raise from the tunnel cut the ore at a height of about 100 ft. The development work is not yet sufficient to determine the size of the ore shoot. Ore bins have been built at the portal. The ore will be shipped to Canon City for treatment.

Telluride—Shipments of concentrates during November were as follows: Tomboy, 50 cars; Smuggler-Union, 40; Liberty Bell, 12; total, 102.

Paradox—The Cummings Chemical Co. has discontinued operations on its carnotite properties temporarily, in view of unsatisfactory developments in the market for vanadium bearing minerals.

IDAHO

Coeur d'Alene District

Gold Hunter Shuts Down; Other Producers May Follow—Wage Cut Expected Soon

Wallace—Development work at the Interstate-Callahan since production was suspended on Oct. 1 has yielded gratifying results bearing on the continuity of the orebody at great depth. A short time before the shutdown the shaft had been completed to the No. 10 level and crosscutting started to the vein. This level is 1,250 ft. below the main working tunnel and probably 3,000 ft. from the surface. The crosscut disclosed over 4 ft. of high-grade zinc-lead ore and drifting is now progressing with every indication that the ore showing will be fully as good as on No. 9, 200 ft. above, where the shoot is 300 ft. long. After drifting to whatever extent deemed necessary, the company will sink another 200 ft. and open up No. 11 level. This and other developments work is making steady additions to the company's proved ore reserves and insures maximum production when a profitable zinc market comes back.

Gem—The Black Bear Mines Co. has suspended development operations after doing much preliminary work which has placed the property in excellent condition for future operations.

WASHINGTON

Washington Producers Forced To Curtail

The depression in the metal market is seriously effecting producers in Washington. The Electric Point mine in the Northport district, the major lead producer of the state, has reduced its crew to twenty-five men. These will be employed on development. All ore necessarily mined will be stored. The Sunset Copper mine in the Cascades its putting its mine and mill in shape and expects to close down some time this month. The United Silver-Copper at Chewelah has decreased its force. The copper ore in this last property is heavily "sweetened" with silver and the favorable silver market may encourage the continuation of operations.

Colville.—The Old Dominion mine, a bonanza twenty years ago, has been reopened. After a year's development work the lessees report that they have developed shipping ore. The ore is high-grade silver-lead occurring as replacement chimneys in limestone and the erratic occurrence of the ore makes development uncertain.

ILLINOIS

Cave-in-Rock Fluorspar Co. Buys Julia F. Mines

Elizabethtown — Winfred Ledbetter, of Rosiclare, Ill., underground foreman at the Rosiclare Fluorspar & Lead Co.'s mine, was run down by a mine motor on Dec. 11 and killed. It is reported that he was walking down the drift without a light.

MINNESOTA

Cuyuna Range

Only Six Mines Now Operating on Range

Crosby—With the closing of the open pit mines for the winter and the recent shutdown of several of the underground properties the Cuyuna Range is left with but six mines actively operating, and only five of these are producing ore at the present time. These are the Kennedy and Meacham mines, Rogers-Brown Ore Co.; the Croft mine, of the John A. Savage & Co.; the Armour No. 2 mine, of the Inland Steel Co.; and the Bonnie Belle mine, of the Liberty Mining Co. The Maroco mine at Trommald is developing an open-pit property of washable iron ore which is expected to be an active shipper with the opening of navigation in the spring.

Shipments from the Cuyuna through the Lake ports for the season of 1920 amounted 2,127,168 tons as compared with a total shipment of 1,819,935 tons last season. In addition to the above Lake shipments about 50,000 tons has gone forward by all-rail shipment to furnaces this season, chiefly from the Bonnie Belle, Sagamore and Arko mines. The bulk of the rail shipments were made to the Zenith Furnace Co., Duluth; smaller shipments went to the South Chicago plant of the Steel & Tube Co. of America.

Cuyuna—The Biwanago Mining Co., diamond drill contractors, is operating two drills underground at the Kennedy mine, drilling from upper levels to block out ore ahead of development on the new 362-ft. level.

Ironton—Installation of an electric hoisting plant and transfer of other surface equipment into new quarters at the Feigh mine of the Northwestern Improvement Co. is nearly completed and the operators plan to resume underground mining early next month.

Whitmarsh Mining Co. has begun exploring with two drills on lot 5, section 9-46-29, known as the Huntington mine. This property, operated as an underground mine in 1918 and 1919, has since been idle. The orebody may now be stripped and worked by steam shovel.

Riverton—It is reported that Williams, Carlson, et al., fee owners of the Rowe mine, recently closed down, will institute proceedings against the Pittsburg Steel Ore Co. to recover damages for alleged loss of several hundred thousand tons of ore in mining operations carried on by that company.

Mesabi Range

Construction of Mesabi Iron Co.'s Plant Progressing

Nashwauk—Due to a mud slide in La Rue pit, a shovel working on stripping was overturned, killing one man. Two were caught in the wreckage but one was recovered after a short duration of time.

Babbitt—Construction of the main mill and adjacent buildings comprising the plant of the Mesabi Iron Co. for the treatment of low-grade magnetic iron ore is in progress and it is estimated that the plant is 40 per cent complete. It is anticipated that under ordinary conditions the plant will be running by the first of the summer.

MICHIGAN

Marquette Range

Trumbull-Cliffs Furnace Stock Offered To C.-C. I. Employees

Ishpeming—Employees of the Cleveland-Cliffs Iron Co. are being offered stock of the Trumbull-Cliffs Furnace Co. on an installment basis. The stock is 8 per cent cumulative preferred and is guaranteed by the Cleveland-Cliffs. The par value is $100 and each employee has the privilege of subscribing to ten shares, making payments of 10 per cent per month for ten months. Many have already availed themselves of the offer, which expired on Dec. 20. The Cleveland-Cliffs Iron Co. is now being reorganized under the laws of Ohio instead of West Virginia, and the capital stock is being increased.

Negaunee—The first cut in wages on the Marquette Range has been announced for the Rolling Mill mine, operated by Clement K. Quinn & Co. The reduction amounts to 25 per cent and took effect Dec. 16. The only other mining company in the iron ore district to announce a new scale of wages is the Charcoal Iron Co. of America, operating the Yale mine on the Gogebic Range. It is expected that other companies will make cuts after Jan. 1.

Gogebic Range

"G" Pabst Shaft Has Two Accidents

Ironwood—The Oliver company has received eight electric mine locomotives which will be distributed among its several mines on this range. Several will be sent to the Tilden mine, where a rotary converter has been installed. They will be used on the stockpile trestles as well as underground.

There were two hoisting accidents in "G" shaft of the Pabst mine last week. On Dec. 3 a wheel came off one of the skips and when the skip came up into the shaft house the front end wedged between the rails, smashed some of the bracing in the shaft house and turned upside down. The damage was not so great but what hoisting could be resumed the next shift, however. On Dec. 8 when the cage was coming up with a load of men a broken rail caught on the bottom plates, tearing them and checking the cage. Then the rail was snapped off and the cage jerked upward, throwing all the men off their feet and bruising them severely, but fortunately causing no more serious injury. The cage continued to surface and the hoisting engineer did not know that anything had gone wrong.

At "H" shaft of the Pabst the skips have been run through the shaft for the first time. This is the fifth electrically equipped shaft which the Oliver company has fitted out in the past two years.

THE MARKET REPORT

Daily Prices of Metals

Dec.	Copper, N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
16	13.00@13.50	31.00	33.75@34.25	4.50	4.60@4.75	5.65@5.75
17	13.00@13.50	31.00	34.00@34.50	4.50	4.60	5.65@5.75
18	13.00@13.50	31.00	34.00@34.50	4.50	4.50	5.65@5.75
20	12.85@13.35	30.75	33.50@33.75	4.50	4.50	5.65@5.75
21	12.85@13.35	30.50	33.00@33.50	4.50	4.50	5.65@5.75
22	13 00	30.00	32.50@32.75	4.50	4.50	5.65@5.75

*These prices correspond to the following quotations for copper, "delivered": 13.25 @13.75, 13.25@13.75, 13.25@13.75, 13.10@13.60, 13.10@13.60, and 13.25c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Dec.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
16	75¼	75¼	86½	215	218	21⅝	23	25¾	27½
17	74¼	74¼	86	211	215	22¼	24	25¾	27¼
18	...	...	...	.....	.....	...	..	...	...
20	74	74¼	85	207½	211¼	23¼	24½	26	27⅝
21	73⅛	73¾	84	205¼	210	22⅝	23½	25¼	26¾
22	73	73½	83	202	207¼	21¾	22½	24	25⅜

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Dec.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
16	348½	99⅛	64¾	41⅞	20	348¼	99⅛	62	40
17	352½	99⅛	64	41	21	352½	99⅛	62½	40
18	349¾	99⅛	63⅝	41	22	351½	99⅛	63¼	40½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Dec. 22, 1920.

To those who have so kindly cooperated with us by furnishing confidential information; and to those who have accepted our report of the metal market as being honest and as accurate as may be: Greeting. May the coming year bring a return to normal conditions, which will mean the utmost of prosperity and happiness to us all!

Possibly in no week this year has business been more stagnant in the metal market than in the one just passed. There has been an utter lack of demand and also of pressure to sell on the part of producers, many of whom continue off the market at present prices. Under these conditions, our quotations are largely nominal. More interest is being taken in the internal affairs of the American Smelting & Refining Co., discussed on pages 1229 and 1230 of this issue, than in selling.

Transatlantic freight rates to England continue at the figure set by the conference, that is, $13 per ton for copper and $12 for lead, but rates from ports in the Hamburg area are quoted as low as $5 and $6. Transpacific rates to Hongkong and Kobe are given as $11.25 per ton.

Copper

Large producers continue to hold for 14c. delivered, and we have no reports that indicate that they are cutting under this figure. Smaller producers have offered copper during the week at 13.50 @13.75c., and at least one large outside interest is willing to sell at 13.125@ 13.25c. delivered. Some business has been reported at each of these levels, but the total volume is insignificant. The dullness is incident to business conditions, as well as the season, and includes export as well as domestic demand.

The firm of Guggenheim Bros. announces that on and after Jan. 1, 1921, it will act as a sales agent for the sale of metals. This agency will sell the entire production of copper of Utah Copper Co., Chino Copper Co., Ray Consolidated Copper Co., Nevada Consolidated Copper Co., Chile Copper Co., Braden Copper Co., and Kennecott Copper Corporation. The sale of metals through this agency will be under the management and executive direction of Joseph Clendenin, who is now vice-president in charge of sales for the American Smelting & Refining Co. Hamilton M. Brush will take charge of the smelting company's copper sales. The copper smelting and refining contracts between the American Smelting & Refining Co. and the other companies mentioned will remain unaffected.

Lead

On Monday, Dec. 20, the A. S. & R. reduced its official price of lead from 5c. to 4.75c., New York and St. Louis.

Inquiries have been fairly numerous and well distributed during the last week. They have been for prompt delivery and have resulted in few sales, a fact which leads to the thought that they are made in many cases to establish a basis for inventories. Sellers of lead on contract report that such deliveries are being accepted fairly well at current prices, and most of the producers will go into the new year with little unsold lead on their hands. Demand for futures has been slack, however, and unless business picks up after January first, stocks are likely to accumulate rapidly, despite curtailed production.

Demand is utterly lacking in St Louis.

Zinc

The price of zinc has remained stationary, with practically no business. It would seem that European zinc could be imported profitably, but it probably could not be sold except at markedly lower prices than the nominal ones which we quote. Also, domestic consumers, in general, demand a better quality than the Belgian product, which contains up to 2.5 per cent lead and 0.25 per cent iron.

Tin

Practically no business has been done in tin since our last report. Even an inquiry for a 25-ton lot is provocative of a great deal of noise and much tele-

phoning. We understand that the Straits government has advanced the price to be paid for the tin production of that country to an equivalent of £236 c.i.f. London. When this tin is finally sold, it will prevent any sudden rise in the price, although it will no duobt be marketed carefully.

Straits tin for future delivery: Dec. 16th, 35.50@36c.; 17th, 35.50@36c.; 18th, 35@35.50c.; 20th, 34.50@34.75c.; 21st, 34@34.50c.; 22d, 33.75@34c.

Arrivals of tin in long tons: Dec. 14th, Australia, 125; China, 10; 20th, Straits, 300.

Silver

Referring to our comments in last week's report, the market for the last week has justified these remarks, as prices have ruled at a slightly higher level than for the preceding week. The disposition to sell appears to be growing less, and at times considerable inquiry at current prices springs up. Buying for account of the Indian bazaars has been reported of late at the recent low points, which has added strength to the market. It would seem as if silver had steadied, at least for the present, at about current figures.

Mexican Dollars—Dec. 16th, 49¼; 17th, 49¼; 18th, 48½; 20th, 47⅝; 21st, 47⅝; 22d, 48½c.

Gold

Gold in London: Dec. 16th, 117s. 6d.; 17th, 116s. 2d.; 20th, 117s. 5d.; 21st, 115s. 9d.; 22d, 116s. 6d.

Foreign Exchange

Sterling and most other foreign exchange has shown an upward tendency during the last week, owing to year-end settlements and Christmas remittances. On Tuesday, Dec. 21, francs were 5.89c.; lire, 3.41c.; and marks 1.365c. New York funds in Montreal have advanced to the highest point in many years, and were quoted at 19⅞ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c.; nominal list prices. Sales reported as low as 22c.

Antimony — Chinese and Japanese brands, 5⅞c.; market quiet. W.C.C. brand, 6¼@6½c. per lb. Cookson's "C" grade, 11@12½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony[1] (200 mesh), 7¼c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 7c.

Bismuth—$2.40 per lb., 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100-lb. lots and over, f.o.b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$75 per oz.

Platinum—Firm at $75 per oz.

Quicksilver—Nominally $50 per 75-lb. flask, with second-hands selling as low as $47 per 75-lb. flask. San Francisco wires $45. Market dull.

[1]Rhodium—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]Selenium—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

[1]Tungsten Metal—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

[1]Manganese Ore—45@50c. per unit, seaport; chemical ore (MnO_2) $60@$65 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

[1]Titanium Ores—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

[1]Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.50, f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.25, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]Zircon—Washed, iron free, 5c. per lb.

[1]Zirkite—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 18—Zinc blende, per ton, high, $36.40, basis 60 per cent zinc; premium, $32; Prime Western, $30; fines and slimes, $27.50@$25. Calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $34.80; calamine, $30; all zinc ores, $34.72.

Lead, high, $58.50; basis 80 per cent lead, $55@$47.50; average settling price, $53.70 per ton.

Shipments for the week: Blende, 8,225; calamine, 153; lead, 835 tons. Value, all ores the week, $335,770.

Sellers were expecting continued favorable market conditions until Friday, when news of the metal trade of Germany with England was received. Sellers realized then that $30 was the best that could be expected, and a number marketed their ore. Purchases, however, were only 5,200 tons. Production practically balanced the shipment.

Platteville, Wis., Dec. 18—Three cars of blende was sold Monday at $37 base. Only thirteen producing mines remain operating. Shipments for the week: Blende, 456; lead, 39 tons. Shipments for the year: Blende, 60,341; calamine, 2,551; lead, 4,562; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 1,182 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,500; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton, ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $8@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton, f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$16 per ton, carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c. Lubricating grade commanding the best price is a fine flake, passing a 100@120 mesh, and running higher than 96 per cent carbon. Linotype machines use a flake passing 90 mesh and standing on a 120 screen, with 90 per cent carbon, retailing at 75c. to $1 per lb. and selling to jobbers at 11@40c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block; No. 6, 55c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25; all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150 @$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.40 per lb.; No. 2, $1.25. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices being f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18; all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 12@12½c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $150, freight allowed; $145, f.o.b. seaboard bases; English, $135@ $140, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $60@$65, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $78@$80; 75 per cent, $160.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 22½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9½c. in quantity, mill lots.

Nickel Silver — Unchanged at 34½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 21½c.; sheathing, 21½c.; rods, ⅝ to 3 in., 18½c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter: zinc plates, 11½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Dec. 21, 1920

The steel market is stagnant as regards most independents. The Steel Corporation is booking a fair amount of business from its regular customers, and has received at least one important order from a consumer of long standing, but not formerly a Steel Corporation customer.

The independent market remains, in general, on the level of the Steel Corporation prices, except that independent pipe prices are still $7 to $10 a ton above those of the Corporation. Shading is fully expected to develop in some products. An important inquiry just out, for 16,000 tons of sheets for first half, may test the situation with respect to sheets. Western mills are shading the Pittsburgh basis in some lines.

Pig Iron—The market remains stagnant, with prices nominal at $35 for bessemer and foundry and $33 for basic, Valley. Lower prices are likely next month.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville—Furnace, $7.00; foundry, $6.00.

The Decline in Sulphur

SULPHUR is used principally in the paper, powder, chemical, fertilizer, and kindred trades, and the world now obtains its requirements chiefly from the United States, Sicily, and Japan. The presence of sulphur in the Gulf section of this country was discovered in boring for petroleum. It is found about 1,000 ft. below the surface of the earth, impregnated in limestone, and is recovered by the Frasch apparatus, which consists of a series of concentric pipes, through which superheated water is forced, melting the sulphur *in situ*, after which it is raised to the surface by air pressure, deposited in a bin, and readily solidifies after exposure to the atmosphere.

The three principal operating companies in the United States are the Union Sulphur Co., the Freeport Sulphur Co., and the Texas Gulf Sulphur Co., the last named being organized during the war, but did not begin to produce until after the armistice was signed.

It is estimated that the combined possible production of the three companies mentioned exceeds the normal domestic demand for sulphur. The pre-war consumption of sulphur in the United States amounted to about 350,000 tons, but in 1918, at the time the armistice was signed, owing to the extraordinary demand for war purposes, the United States was using at the rate of 1,350,000 tons per annum, and even now the consumption is still much larger than before the war, owing to the fact that the fertilizer companies are utilizing this mineral instead of pyrites in making sulphuric acid.

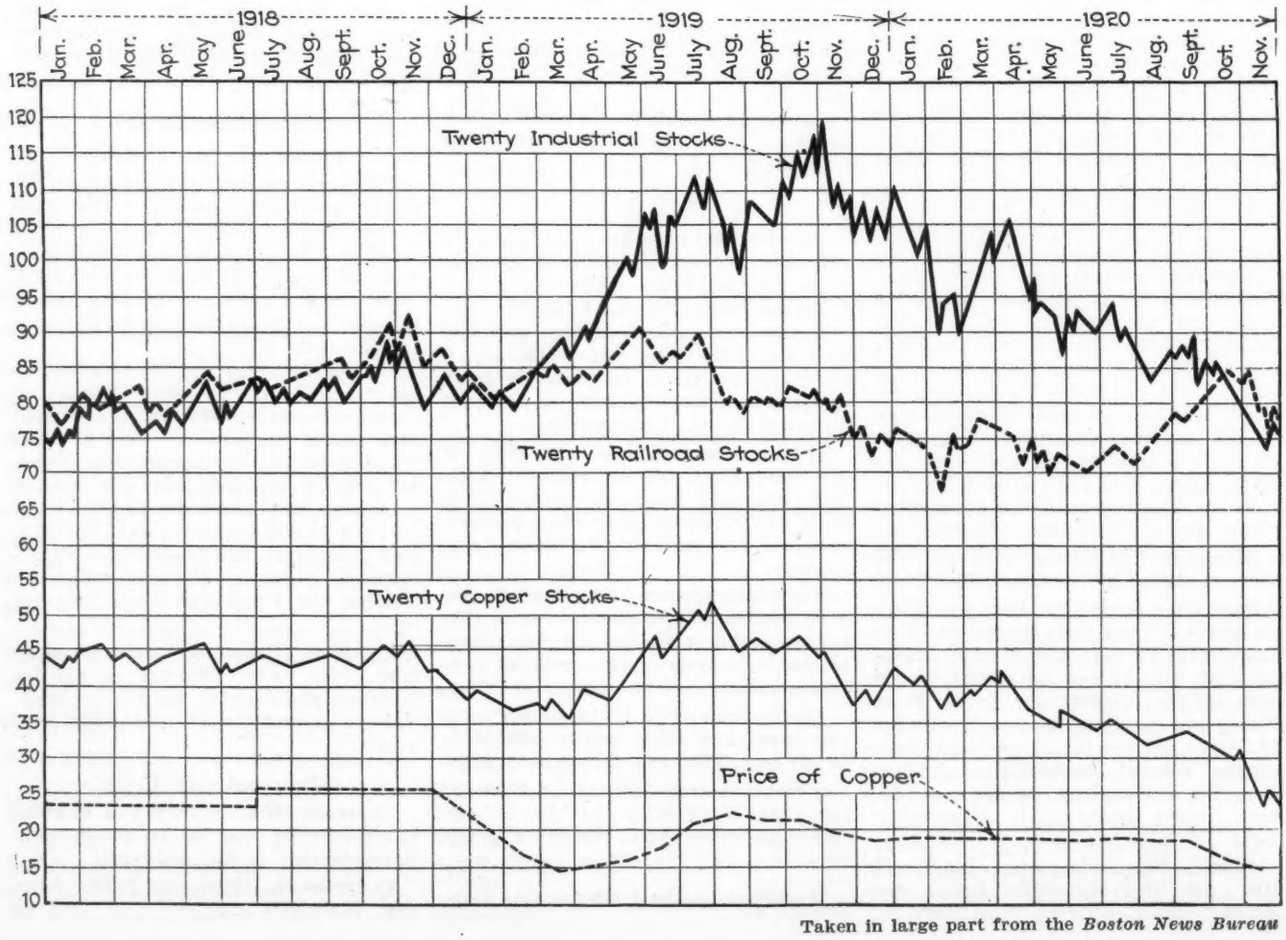
The United States must also supply the deficit abroad, as Sicily is turning out only about half of the quantity mined in pre-war days. The lack of labor in Sicily has reduced the output, and the cost of production has increased, owing to higher wages; in fact, the price at Sicilian mines is much higher than present quotations here.

The Japanese output, during the first half of 1920, was estimated at 21,000 tons, most of which was used locally. The price there is also much dearer than in the United States. It is interesting to compare the present prices of sulphur, with pre-war figures, inasmuch as this mineral today is relatively the cheapest heavy chemical. Prior to the war, the price was $20 per long ton at the mines, and $22 at eastern seaboard, say New York, Philadelphia, and Baltimore; whereas present quotations are $16 at the mines, and $20 to $22 at seaboard. When the current value of the dollar is considered, sulphur today is selling at practically half of its pre-war price.

Twenty-three Uses of Sulphur and Sulphuric Acid

For those whose interest in the uses of sulphur is extensive, the following comprehensive list will be informative: 1—Manufacture of sulphuric acid for a wide variety of uses. 2—Sulphurous acid. 3—Chemical reduction of wood in the pulp mills. 4—Warfare gases, gunpowder, and other explosives. 5—Fuses and matches. 6—As a fumigant, fungicide, and germicide. 7—Fertilizers. 8—Bleaching. 9—Rubber manufacture. 10—Drugs. 11—Making various colors. 12—Vulcanized oil. 13—Used by malt companies. 14—As a preservative for beef. 15—For evaporating apples. 16—Used by glue and photographic-film companies. 17—In certain processes of smelting and precipitation. 18—For the bedding of heavy machinery. 19—For the manufacture of strong acid for storage batteries, and for preparing rubber for insulation. 20—Carbon disulphide. 21—Sulphur chloride. 22—Carbon tetrachloride. 23—Manufacture of other chemicals.

Chart of New York Stock-Market Fluctuations for the Last Three Years



Taken in large part from the *Boston News Bureau*

COMPANY REPORTS

Alaska Gastineau Mining Co. Continues Operating at a Loss

Gold; Alaska

A summary of results of mining and milling of the Alaska Gastineau Mining Co. for the third quarter of the fiscal and calendar year 1920, together with comparisons of the principal items for the previous quarters, follows:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Tons milled	436,103	537,754	625,890
Gross value	$0.89	$0.85	$0.84
Yield	0.71	0.68	0.66
Tails	0.18	0.17	0.18
Extraction per cent	79.82	79.39	79.16
Value recovered	$0.71	$0.68	$0.66
Operating expenses, less miscellaneous income	0.89	0.79	0.79
Loss per ton	$0.18	$0.11	$0.13

During the quarter, 488,103 tons of ore was broken in the mine and 435,931 tons trammed to the oreways, as compared with 646,327 tons broken and 535,874 tons trammed during the previous quarter. Of the amount trammed about 32.7 per cent represented excess ore drawn from the caved stopes. Various stopes on the 8th, 9th, 10th and 11th levels were mined during the period. Stoping was completed on the 11th level, and Nos. 1 and 2 West on the 9th level. A large tonnage of broken ore is therefore available in these stopes. A total of 716 ft. of development work was done.

Owing to the scarcity of labor and small tonnage of ore delivered, the mill was operated on a two-shift basis in the coarse- and fine-crushing departments throughout the quarter, the concentrating department being operated on a three-shift basis. A total of 436,103 tons of ore was milled, as compared with 537,754 tons for the previous quarter.

The company's generating stations and transmission lines operated without interruption during the quarter. Very little power was supplied to other industries in the district, owing to the abundance of water power during the summer months, which was available to these industries. The gross value of ore delivered to the mill during the quarter averaged $0.89 per ton, or an increase over the second quarter of $0.04. Operating expenses, less miscellaneous income, amounted to $0.89 per ton, as compared with $0.79 per ton for the previous period. The miscellaneous income showed a net loss of $8,156.18, the loss sustained in the operation of the company's boarding houses having been in excess of the amount received from the sale of power.

The following statement compares the operating results of the third quarter with those of previous quarters:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
REVENUE			
Gross value of bullion and concentrates produced	$308,799.79	$364,866.48	$413,246.04
EXPENSES			
Ore production and transportation	$202,827.84	$237,696.86	$285,406.01
Milling	137,606.97	150,980.00	172,441.83
Shipping and smelting charges	13,495.49	15,339.45	17,572.48
Administration and general expense	27,772.34	22,520.62	22,410.60
Total operating expenses	$381,702.64	$426,536.95	$497,830.92
	(a) $72,902.85	(a) $61,670.45	(a) $84,584.88
Miscellaneous income	(a) 8,156.18	(a) 10.67	2,966.94
Operating loss	$81,059.03	$61,681,12	$81,617.94

(a) Loss.

Included in costs in the above statement are prepaid development items representing costs of breaking and preparing ore in previous periods, which have been carried on the books as deferred charges. Consequently, although the above operating statement shows a loss of $81,059.03 after including these charges, the actual cash receipts and disbursements for the period reflect a cash loss of only $17,693.84.

Nevada Consolidated Copper Co. Increases Deficit

Copper; Nevada

A statement of production and the result of operations of the Nevada Consolidated Copper Co. for the third quarter of the fiscal and calendar year 1920 shows that during the three months ended Sept. 30 there was produced 13,297,364 lb. of copper, as compared with 13,063,667 lb. for the preceding three months. Operating at about one-half normal capacity during the quarter, a total of 671,063 dry tons of Nevada Consolidated ore, an average of 7,294 tons daily, was milled, as against 691,095 dry tons, an average of 7,595 tons per day, concentrated during the preceding quarter. The average copper assay of the ore milled during the current quarter was 1.50 per cent, as compared with an average grade of 1.47 per cent copper for the preceding quarter.

Of the total tonnage milled 74 per cent was shipped from the steam-shovel pit and 26 per cent from the underground workings of the Ruth mine. In addition to the tonnage of concentrating ores treated, there was smelted 1,692 tons of a higher grade of ore from the Ruth mine.

The cost of production for the quarter, including the fixed charges to cover depreciation of mine, mill and smelter plants, and equipment, and all administrative and general expenses, and after crediting miscellaneous earnings, including gold and silver values, was 16.04c. per lb. of copper, as compared with a cost, similarily computed, of 15.56c. per lb. for the quarter ended June 30, 1920.

The result of operations for the quarter is herewith presented in comparison with the financial outcome of the two preceding quarters of the current year. The costs include, as above stated, the customary monthly charges for depreciation of plant and equipment and all overhead expenses:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Operating profit or loss	(a) $434,043.58	$47,276.49	$132,529.28
Miscellaneous income	350,863.99	336,723.69	83,053.86
Net gain or loss	(a) $83,179.59	$384,000.18	$215,583.14
Distribution to stockholders	499,864.25	499,864.25	499,864.25
Net deficit	$583,043.84	$115,864.07	$284,281.11

(a) Loss.

The operating loss as shown for the current quarter is based upon an average carrying price of 15.417c. per lb. of copper, as compared with a basing price of 18.50c. for the second quarter and 22.66c. for the first quarter. The miscellaneous income includes credits for the precious metals recovered and Nevada Northern Ry. Co. dividends. A quarterly distribution of 25c. per share to stockholders was made Sept. 30.

Davis Daly Copper Co.

Copper: Montana

The report of the Davis Daly Copper Co. for the quarter ending Sept. 30, 1920, shows that 20,974 tons were mined, producing 2,486,806 lb. of copper and 107,023 oz. of silver. The average assay of the ore shipped was 6.51 per cent copper and 5.63 oz. of silver per ton. Cash and quick assets on Sept. 30, 1920, amounted to $568,899.06. Receipts and disbursements follow:

Ore returns	$308,869.15
Miscellaneous revenues	77,516.58
Total receipts	$386,385.73
Development	$57,867.26
Mining cost	176,165.82
Equipment	13,203.28
Butte general expense	56,200.24
Boston expense	13,645.51
Total disbursements	$317,082.11

Total development for the quarter was 4,268 ft.

MINING STOCKS

Week Ended December 18, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	....	....	*50		
Ahmeek	Boston	46½	43	43	Sept.'20, Q	.50
Alaska-B.C.	N. Y. Curb.	⅞	¾	7/16		
Alloues	Boston	18½	18¼	18	Mar.'19,	1.00
Anaconda	N. Y.	38	35	35	Nov. '20, Q	1.00
Ariz. Com'l	Boston	6½	5⅞	6	Oct. '18,	.50
Big Ledge	N. Y. Curb.	⅜	5/16	⅜		
Bingham Mines	Boston	....	....	9½	Sept. '19, Q	.25
Calumet & Ariz.	Boston	43½	42	42½	Sept.'20, Q	1.00
Calumet & Hecla	Boston	215	200	215	June '20, Q	5.00
Canada Copper	N. Y. Curb.	....	....	*20		
Centennial	Boston	7	6½	7	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	27	25½	26½	Dec. '20, Q	1.00
Chief Consol	Boston Curb	3	2 11/16	2 11/16	Nov. '20, Q	.10
Chile Copper	N. Y.	9½	8½	8⅝		
Chino	N. Y.	18	18	18½	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*32½	*31	*32		
Con. Ariz.	N. Y. Curb.	....	....	1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb.	....	....	1⅛		
Copper Range	Boston	26	25⅛	25⅛	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*45	*41	*43		
Davis-Daly	Boston	5⅛	5⅛	5⅛	Mar. '20, Q	.25
East Butte	Boston	8	7⅛	7 5/16	Dec. '19, A	.50
First Nat'l	Boston Curb	*75	*60	*61	Feb. '19, SA	.15
Franklin	Boston	2½	2¼	2 5/16		
Gadsden Copper	N. Y. Curb.	....	....	*70		
Granby Consol.	N. Y.	18⅛	18	18⅛	May '19, Q	1.25
Greene Cananea	N. Y.	20⅛	17⅛	17⅛	Nov. '20, Q	.50
Hancock	Boston	3¼	3	3¼		
Houghton	Boston Curb	....	....	*45		
Howe Sound	N. Y. Curb.	2⅛	2⅛	2⅛	Oct. '20, Q	.05
Inspiration Con.	N. Y.	30⅛	29⅛	29⅛	Oct. '20, Q	1.00
Iron Cap	Boston Curb	6½	6	6½	Sept. '20, K	.25
Isle Royale	Boston	18	16⅛	17	Sept. '19, SA	.50
Kennecott	N. Y.	17⅛	16⅜	16⅛	Sept. '20, Q	.50
Keweenaw	Boston	1⅜	1¼	1¼		
Lake Copper	Boston	2	1⅜	2		
La Salle	Boston	1½	1¼	1⅜		
Magma Chief	N. Y. Curb.	....	....	*21		
Magma Copper	N. Y. Curb.	17½	16½	17	Jan. '19, Q	.50
Majestic	Boston Curb	*9	*9	*9		
Mason Valley	Boston	....	....	0.99		
Mass Consol.	Boston	2	1⅛	1⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	4⅛	3½	4		
Miami	N. Y.	15½	15	15⅛	Nov. '20, Q	.50
Michigan	Boston	2½	1	2		
Mohawk	Boston	45	43	43	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb.	5½	5⅜	5⅜		
Nevada Con.	N. Y.	8	8⅛	8⅛	Sept. '20, Q	.25
New Arcadian	Boston	....	....	2½		
New Baltic	Boston Curb	....	....	3		
New Cornelia	Boston	15	14½	14½	Aug. '20,	.25
Nixon Nev	N. Y. Curb.	....	....	*5		
North Butte	Boston	10⅛	9½	9⅝	Oct. '18, Q	.25
North Lake	Boston	....	....	*25		
Ohio Copper	N. Y. Curb.	....	....	3/16		
Ojibway	Boston	1	1	1		
Old Dominion	Boston	16	15⅛	15	Dec. '18, Q	1.00
Osceola	Boston	25	21½	23	June '20, Q	.50
Phelps Dodge	Open Mar.	†175	†150	....	Oct. '20, Q	2.50
Quincy	Boston	36½	36	36	Sept. '20, Q	1.00
Ray Con	N. Y.	12	11⅛	11⅛	June '20, Q	.25
Ray Hercules	Boston Curb	*50	*50	*50		
St. Mary's M. L.	Boston	30⅛	29	29⅛	June '20, K	2.00
Seneca Copper	Boston	17⅛	17⅛	17⅛		
Shannon	Boston	0.90	0 75	0 75	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	5⅜	5⅛	5⅛	Jan. '20, Q	.25
South Lake	Boston	....	....	2		
South Utah	Boston	*6	*6	*6		
Superior Copper	Boston	3½	3	3	Apr. '17,	1.00
Superior & Boston	Boston	1⅜	1⅛	1⅜		
Tenn. C. & C.	N. Y.	7⅛	7	7⅛	May '18, I	1.00
Tuolumne	Boston	*40	*35	*35	May '13.	.10
United Verde Ex.	Boston Curb	24	21½	21⅛	Nov. '20, Q	.50
Utah Consol.	Boston	3⅛	2	3	Sept. '18,	.25
Utah Copper	N. Y.	51	47⅛	47⅝	Sept. '20, Q	1.50
Utah M. & T.	Boston	0.95	0 75	0.90	Dec. '17,	.30
Victoria	Boston	1½	1½	1½		
Winona	Boston	*40	*40	*40		
Wolverine	Boston	11	10	10½	Jan. '20, Q	.50
LEAD						
Hecla Mining	N. Y. Curb.	4⅛	4	4⅛	Sept.'20,QX	.15
St. Joseph Lead	N. Y.	12⅛	10⅛	10	Dec. '20,QX	.50
Stewart	Boston Curb	*6	*6	*6	Dec. '15,	.05
Utah Apex	Boston	3	2½	2	Nov. '20, K	.25
ZINC						
Am. Z. L. & S.	N. Y.	6⅛	6⅛	6⅛	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	31	26	31	Nov. '20, Q	1.50
Butte C. & Z.	N. Y.	5	4⅛	4½	June '18, I	.50
Butte & Superior	N. Y.	9⅜	8½	8⅝	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	6½	5⅜	5⅜	June '20, Q	.50
New Jersey Z.	N. Y. Curb.	137	135	135	Nov. '20, Q	4.00
Success	N. Y. Curb.	*2	*1	*2	July '16,	.03
Yellow Pine	Los Angeles.	*45	*40	*40	June '20, Q	.03

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly
SA, Semi-annually. BM, bi-monthly. K, Irregular. I, Initial. X, includes extra

Stock	Exch	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	⅞	⅞		
Alaska Juneau	N. Y.	1⅜	....	1⅜		
Carson Hill	N. Y. Curb.	....	....	22½		
Cresson Consol. G.	N. Y. Curb.	1⅛	1⅛	1⅛	June '20, Q	.10
Dome Ex.	Toronto	*41	*41	*41		
Dome Mines	N. Y.	10⅛	9⅞	10	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡....	....	*73	Dec. '20, Q	.02
Goldfield Con.	N. Y. Curb.	*6	*5	*5	Dec. '19,	.05
Hedley	Boston	....	....	4½	June '19,	.10
Hollinger Con.	Toronto	5.65	5.55	5.60	Dec. '20, BM	.05
Homestake	N. Y.	50	50	50	Sept. '19,	.50
Kirkland Lake	Toronto	*39⅛	*38⅛	*39		
Lake Shore	Toronto	1.03	1.00	1.03	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	1.84	1.81	1.84	Sept. '20, K	.05
Porcupine Crown	Toronto	*18	*15	*17⅛	July '17,	.03
Portland	Colo. Sprgs.	‡....	....	*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb.	*3⅛	*2⅞	*3	May, '19,	.05
Silver Pick	N. Y. Curb.	*5⅛	*4	*5		
Teck Hughes	Toronto	*12	*9	*12		
Tom Reed	Los Angeles.	1.25½	1.20	1.23	Dec. '19,	.02
United Eastern	N. Y. Curb.	2⅛	2 1/16	2 1/16	Oct. '20, Q	.15
Vindicator Consol.	Colo. Sprgs.	‡....	....	*18	Jan. '20, Q	.01
West Dome Consol.	Toronto	*5	*5	*5		
White Caps Min.	N. Y. Curb.	*7	*5⅛	*6		
Yukon Gold	Boston Curb	1⅛	1⅛	1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*20	*18	*20	Apr. '20, M	.03
Beaver Con.	Toronto	*29	*26	*29	May '20, K	.03
Coniagas	Toronto	....	....	2.00	Nov. '20, Q	.12½
Crown Reserve	Toronto	*17	*15	*15	Jan. '17,	.05
Kerr Lake	Boston	2½	2⅜	2½	Oct. '20, K	.12½
La Rose	Toronto	*25	*24	*24	Apr. '18,	.02
McKinley-Dar.	Toronto	*24	*22½	*24	Oct. '20, Q	.03
Mining Corp.	Toronto	1.10	1.05	1.05	Sept. '20, Q	.12½
Nipissing	N. Y. Curb.	7⅛	7	7⅛	Oct. '20, QX	.50
Ontario Silver	N. Y.	4	4	4	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	1/16	⅜	⅜	Jan. '12,	.10
Peterson Lake	Toronto	*10	*9½	*9	Jan. '17,	.01½
Temiskaming	Toronto	*26	*25⅛	*26	Jan. '20, K	.04
Trethewey	Toronto	*17⅛	*14	*16	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	1⅛	1	1		
Barnes-King	Butte	‡....	....	1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston	....	....	*63		
Cashboy	N. Y. Curb.	*7	*5½	*7		
El Salvador	N. Y. Curb.	1/16	⅜	1/16		
Jim Butler	N. Y. Curb.	*17	*15	*15	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*5⅛	*4⅛	*5	June '16,	.05
Louisiana Con.	N. Y. Curb.	⅛	⅛	⅛		
MacNamara M.	N. Y. Curb.	1/16	1/16	1/16	May '10,	.02½
N.Y. Hond. Rosar.	Open Mar.	†11	†9	....	Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1⅛	1 1/16	1 1/16	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb.	1	1 1/16	1⅛		
Tonopah Ex.	N. Y. Curb.	1 1/16	1⅛	1⅛	Oct. '20, Q	.05
Tonopah Mining	N. Y. Curb.	1⅛	1⅛	1⅛	Oct. '20, SA	.05
West End Con.	N. Y. Curb.	1	1/32	1/32	Dec.'19, SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*18	*16	*17	July '20, M	.01
Consol. M. & S.	Montreal	17	16½	16½	Oct. '20, Q	.62½
Daly Mining	Salt Lake	....	....	2.00	July '20, Q	.10
Daly-West	Boston	3⅛	3⅛	3	Oct. '20, Q	.25
Eagle & Blue Bell	Boston Curb	....	....	2½	Apr. '20, Q	.10
Electric Point	Spokane	*7	*4½	*7	May '20, SA	.03
Fed. M. & S.	N. Y.	5	5	5	Jan. '09	1.50
Fed. M. & S. pf.	N. Y.	26½	25	25	Dec. '20, Q	1.75
Florence Silver	Spokane	*12	*12	*12	Apr. '19,	.01½
Grand Central	Salt Lake	....	....	*37½	June '20, K	.03
Iron Blossom	N. Y. Curb.	⅛	⅛	⅛	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	3 20	3.20	3.20	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb.	*7	*6	*7		
Prince Consol.	N. Y. Curb.	1/16	⅛	1/16	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*7	*5	*6	Feb. '19,	.01
Rex Con.	N. Y. Curb.	*5	*5	*5		
South Hecla	Salt Lake	....	....	*60	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb.	1/16	1/16	1/16	Oct. '17,	.05
Tamarack-Custer	Spokane	2.00	1.90	1.90	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.52½	3.32½	3.40	June '20, Q	.10
Wilbert Mining	N. Y. Curb.	*1⅛	*1	*1	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	13⅜	12⅜	12½	Mar. '19,	.50
Internat'l Nickel, pf.	N. Y.	82	78	79	Nov. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	0.80	0.75	0.75	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	....	....	*5		
VANADIUM						
Vanadium Corp.	N. Y.	40½	35½	37	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	87	80	80	Oct. '20, Q	1.50
Asbestos Corp. pf.	Montreal	94½	92½	92½	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	42½	39	39⅛	Dec. '20, Q	1.00
Am. S. & R. pf.	N. Y.	83	81½	82½	Dec. '20, Q	1.75
Am. Sm. pf. A	N. Y.	69½	68	68½	Oct. '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	34⅛	31	32	Oct. '20, Q	1.50
U. S. S.R. & M. pf.	Boston	41½	40	40⅛	Oct. '20, Q	.87½

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ENGINEERING AND MINING JOURNAL

JOSIAH EDWARD SPURR, *Editor*

TENTH AVENUE AT 36TH STREET, NEW YORK CITY

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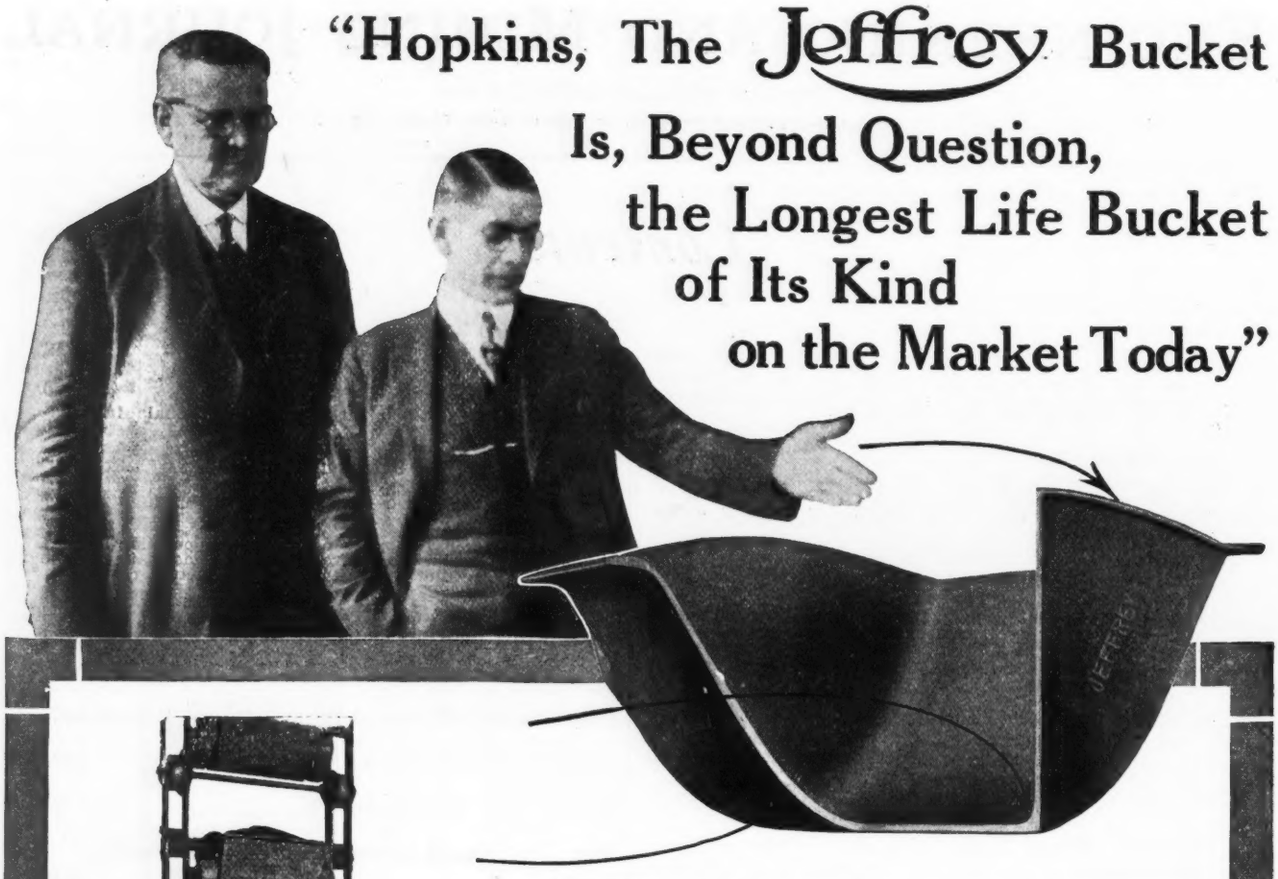

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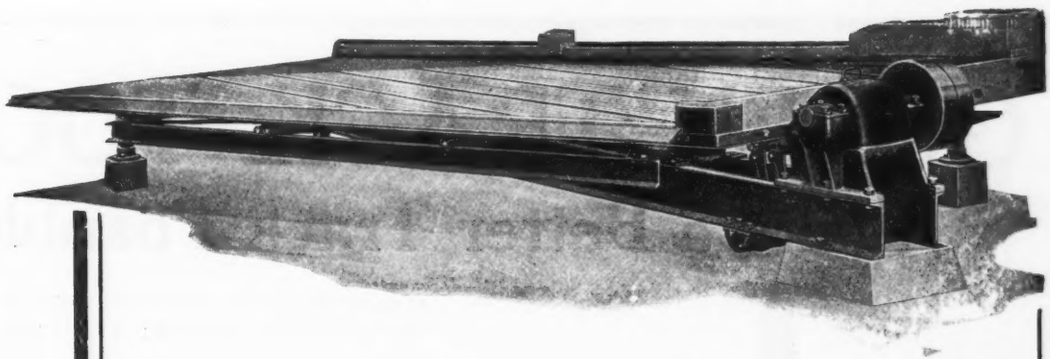

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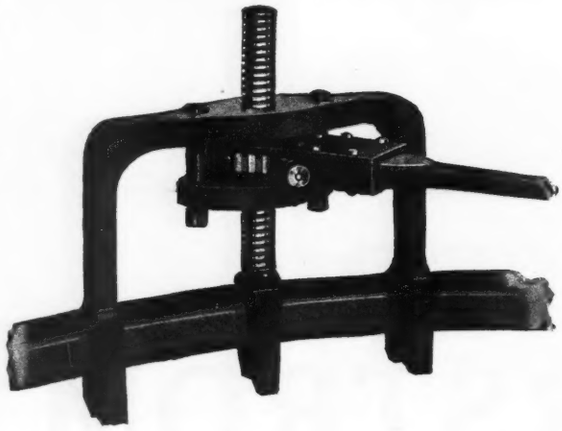

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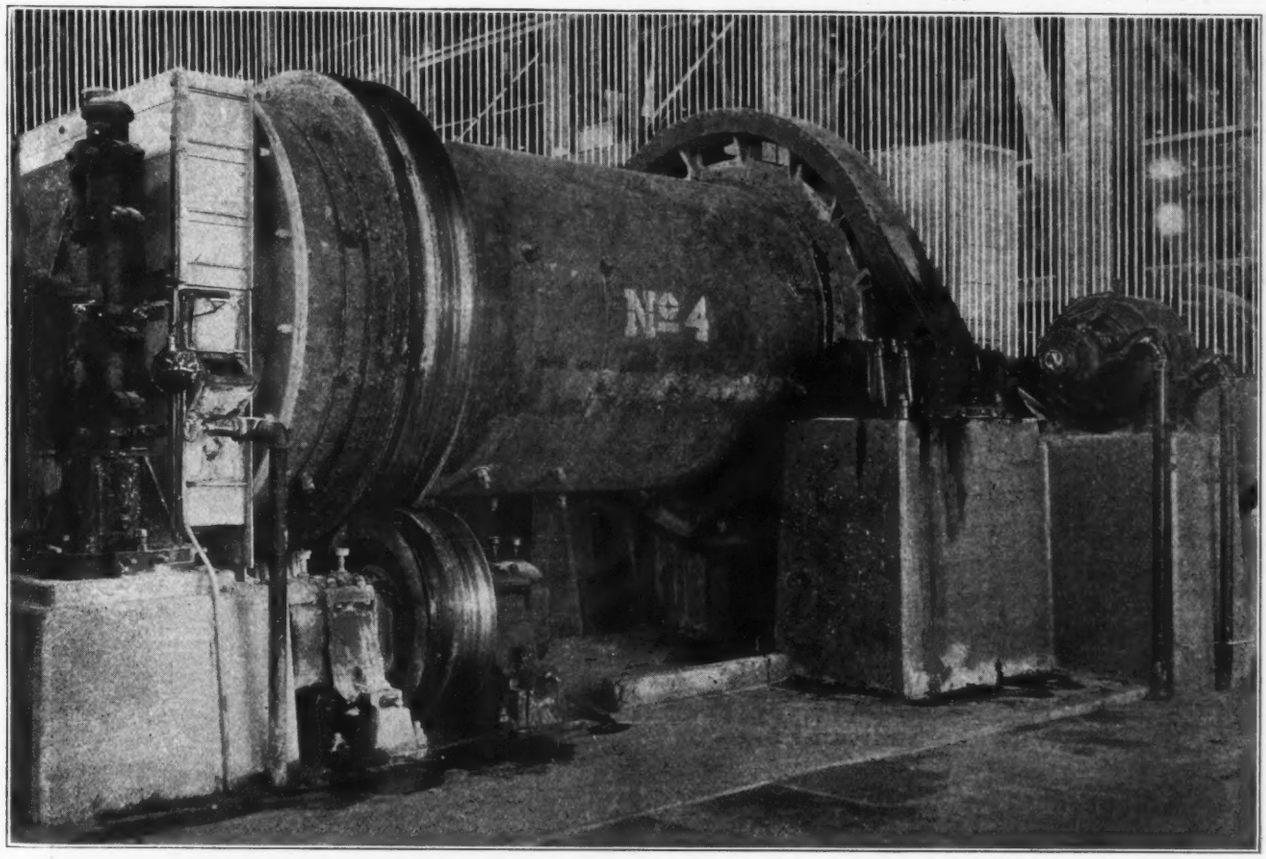

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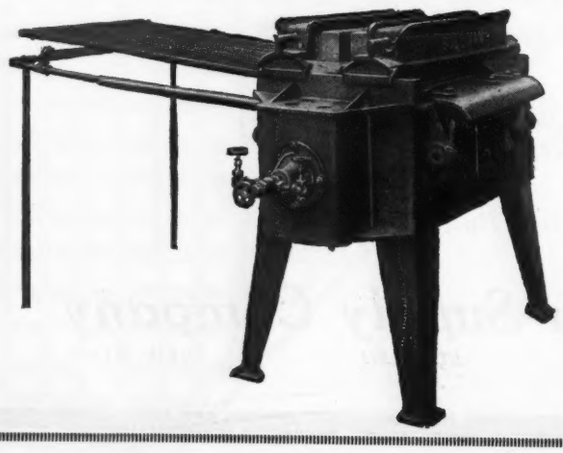

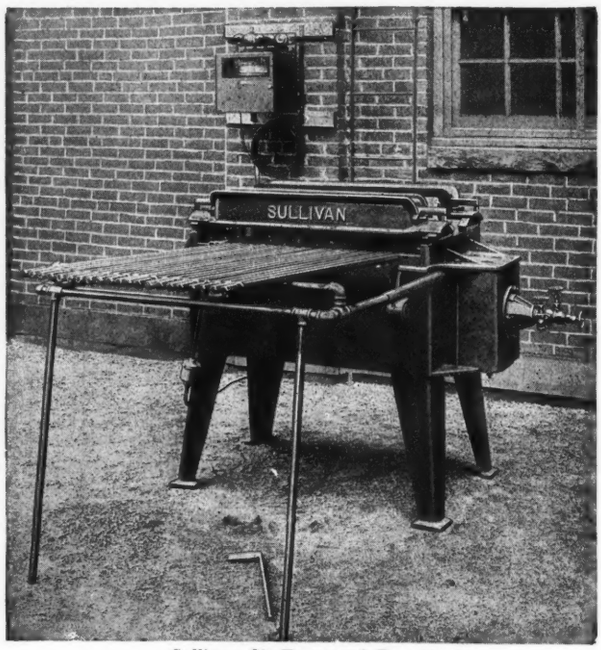

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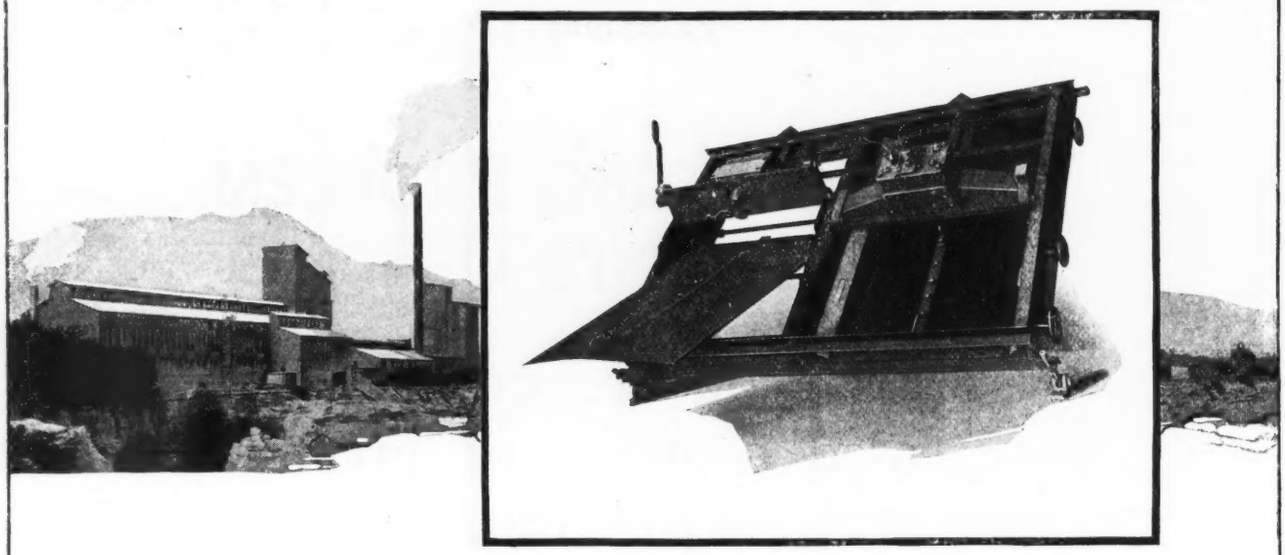
HUM-MER INCLINED SCREEN

Applies Electro-Magnetic Vibration to a "Drumhead" Tension Screen



A FEW PROMINENT USERS OF *HUM-MER* SCREENS

Bethlehem Steel Co.
Pittsburgh Plate Glass Co.
Arizona Copper Co., Ltd.
Ottawa Silica Co.
Morris Fertilizer Co.
Goodyear Tire & Rubber Co.
American Smelting & Refining Co.
Continental Portland Cement Co.
Laclede-Christy Co.
The Norton Co.
Diamond Alkali Co.

"Makes wire cloth screen faster and wear longer"

Write for catalogue No. 42 E

TONNAGE OUTPUT INCREASED

ONE company has installed 17 HUM-MER Inclined Screens. The following data gives the comparative results obtained with the HUM-MERS. In this installation, the desired material is an intermediate product, both the coarse and fines being taken out so that the percent of product in the feed is low.

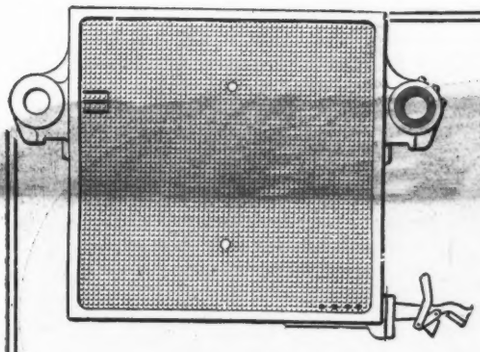
	Screen analysis of product	Tonnage per hour
Old Screen,	95.6% on 40 mesh,	1695 pounds
HUM-MER,	96% on 40 mesh,	4644 pounds

In this particular case a remarkable tonnage of 274% was obtained.

HUM-MER Inclined Screens have been supplied for screening a great variety of materials; both coarse and fine, in fact, the HUM-MERS in the field today have shown definitely that the HUM-MER will handle finer sizing than has ever been possible through a wire cloth screening surface, and this with profitable tonnage.

THE W. S. TYLER COMPANY, *Cleveland, Ohio.*

Manufacturers of Woven Wire Screens and Screening Equipment



Why Cut Holes in Your Filter Cloths?

This design of the Shriver Side-feed plates makes it unnecessary. The clothing of the press is a simple operation. It is only necessary to cut the cloth to the proper size and fold them over each plate.

Shriver
Washing
Filter Presses

The pyramidal surface of the Shriver plates is practically flush with the joint surface—this eliminates the stretching strain on the filtering medium.

The simplicity and rugged construction and operation of the Shriver press is an outstanding feature of its superiority.

Inexperienced help and cheap labor can operate Shriver presses successfully.

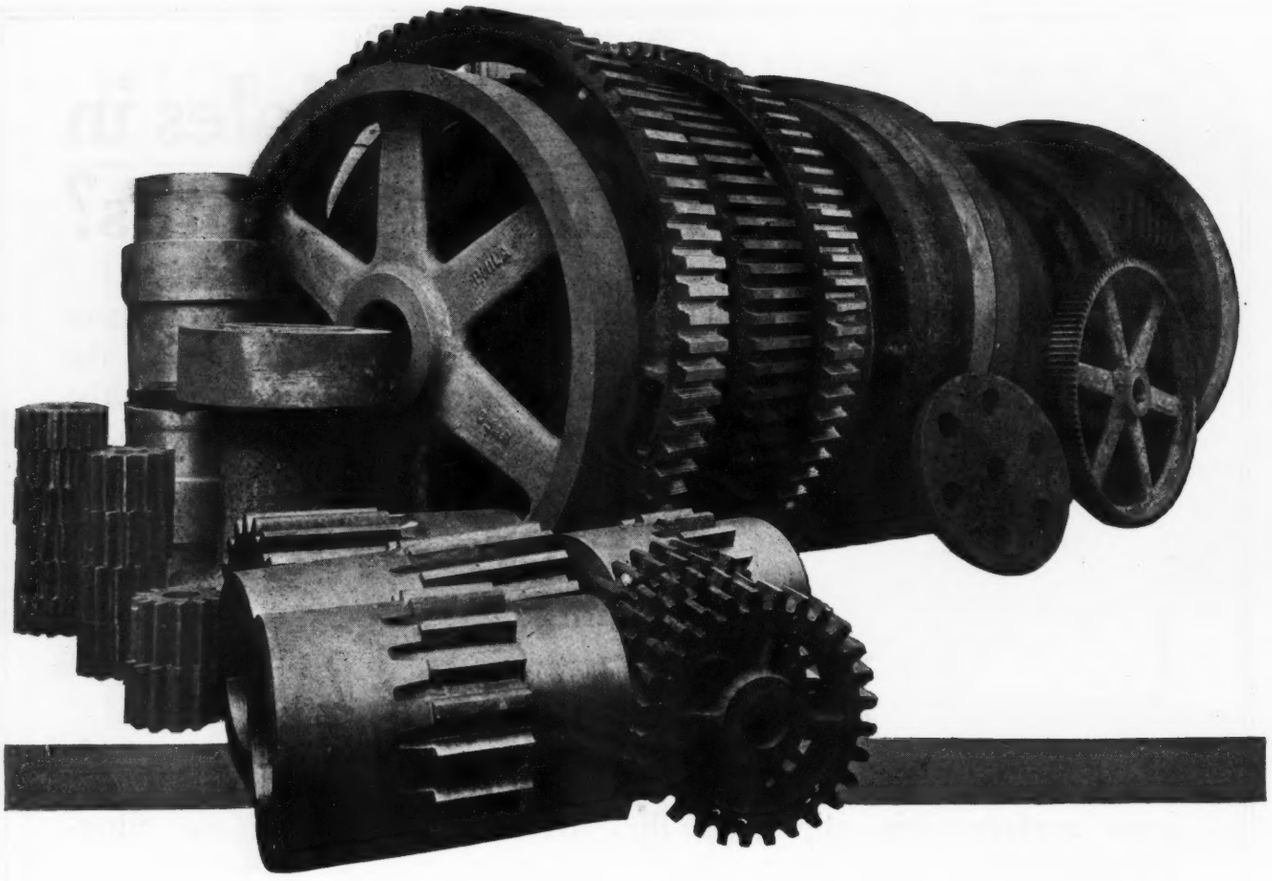
Write for descriptive catalogue containing many other Shriver features. Shriver Filter Presses are time, labor and money savers.

Take Advantage of Shriver Filter Service

Our experimental laboratory and the experience of our filtration experts are at your service to help you determine the best and most economical filtration for *your* particular product. Exact knowledge of filter mediums and pressure will increase output and reduce costs. This service is free to all.

T. SHRIVER & COMPANY

826 Hamilton Street . Harrison, N. J.



All in the Day's Work—

Our plant is not confined to the making of small and medium sized gears. We have the mechanics and the equipment that enables us to meet your most exacting gear needs.

Just look over this little flock at the top of the page. It represents the product of merely one of our numerous departments but it's proof that we have the "know how," to serve you satisfactorily.

Our 24 hour service on small and medium gears is nation known. This same time ratio applies to all gear orders regardless of cut or size. The quality is always GEARS Philadelphia standard.

We have a book that insures against error in ordering. Ask for your copy and try it.

Spur — Bevel — Mitre — Spiral — Worm — Helical

Philadelphia GEAR Works, Phila. Pa.

Sprockets — Racks — Rawhide — Micarta — Gears

PRESCOTT
MENOMINEE

23rd Level, Pabst Shaft
Ironwood, Michigan

Station Pumps in the Pabst Shaft

THERE'S no shambling or relaying of water with Prescott-Menominee Pumps and this installation in the Pabst Shaft of the Oliver Iron Mining Co., Ironwood, Michigan, is no exception.

Here each, for there are two, $4\frac{7}{8}$" x 24" electrically driven Prescott-Menominee Pumps is delivering, direct to the surface, 400 gallons per minute and working against a 1700 foot head.

400 Gallons per Minute

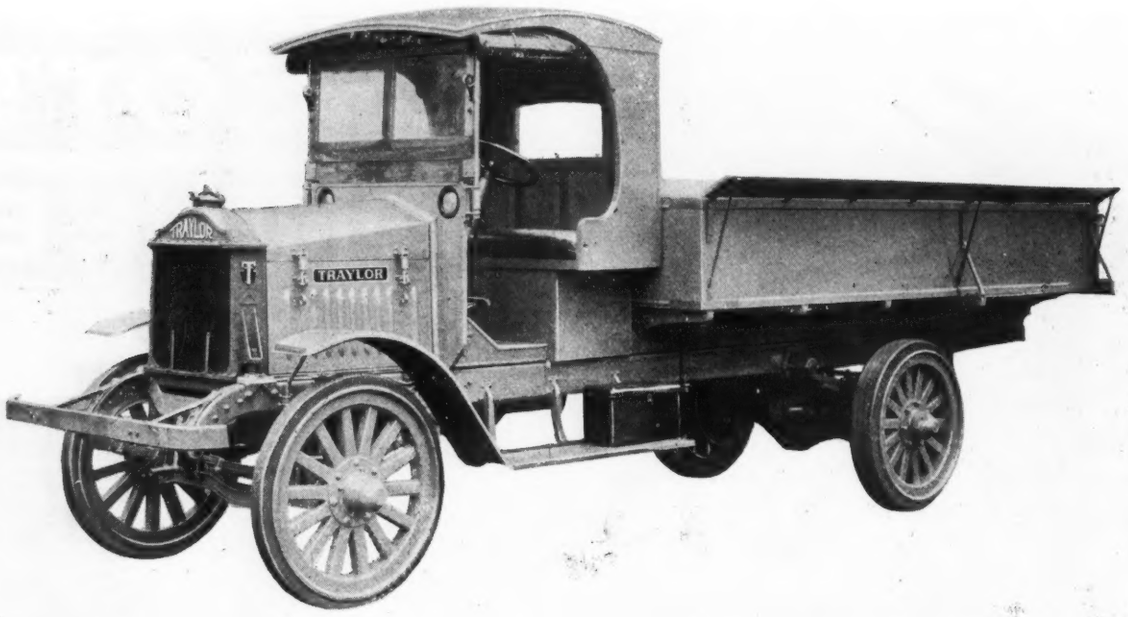
Head 1700 ft.

We specialize in Electric Pumps for deep mines and would welcome an opportunity to discuss your pumping problems with you.

THE PRESCOTT COMPANY

FRED. M. PRESCOTT, President

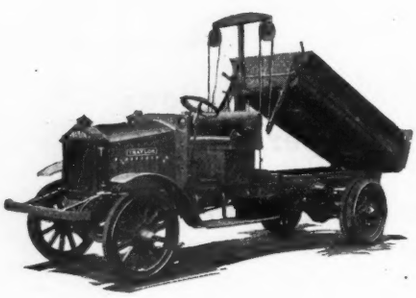
Menominee, Michigan



Every Traylor Truck Leaves the Plant a Complete Unit

From our years of experience in designing mining, milling, and smelter machinery, and our knowledge of the conditions under which they must operate, we know just what a truck is expected to stand and we have built them accordingly. Sufficient weight to stand the loads, ample power to get over the hills and rough roads—and a body for the particular work you wish to use it on—and we build all our own bodies and can furnish any type desired—which means prompt delivery of a complete unit.

This feature should be of as great an interest to the modern mining man as it was to our ancient, yet learned visitors.



Traylor Engineering & Manufacturing Company

Allentown, Pa.

Truck and Tractor Division **Cornwells, Bucks Co., Pa.**

New York, 30 Church St. — Chicago, 1414 Fisher Bldg. — Pittsburgh, 211 Fulton Bldg.

Spokane, Mohawk Bldg. — Los Angeles, Citizens Bank Bldg.

For Immediate Delivery

28 in. x 36 in. Bulldog Jaw Crusher
48 in. x 60 in. Bulldog Jaw Crusher
8 in. Bulldog Gyratory Crushers
36 in. x 16 in. Type "A" Crushing Rolls
42 in. x 18 in. Type "AA" Crushing Rolls.

A Traylor Motor Truck Hauling your concentrates and a Traylor All-Purpose Tractor Cultivating your ranch means real economy.

"Leyner-Ingersoll Drifters"

The engineer says, "One drill for one purpose—that means efficiency." He is right.

The Purchasing Agent says, "One drill for as many purposes as possible—that means economy." He, also, is right.

"Leyner-Ingersoll Drifters" satisfy both. They are essentially drifting or tunnelling drills, and engineers the world over, specify them for this work.

However, they have been successfully adapted to stoping and even for down hole work. Purchasing agents have shown their appreciation of this by specifying "Leyner-Ingersoll" whenever a mounted drill is requisitioned.

Adaptability
Efficiency
Economy

Bulletin 4048, describing the "Leyner-Ingersoll Drifters" will be sent upon request.

Ingersoll-Rand Company
11 Broadway, New York
Offices everywhere

Ingersoll-Rand

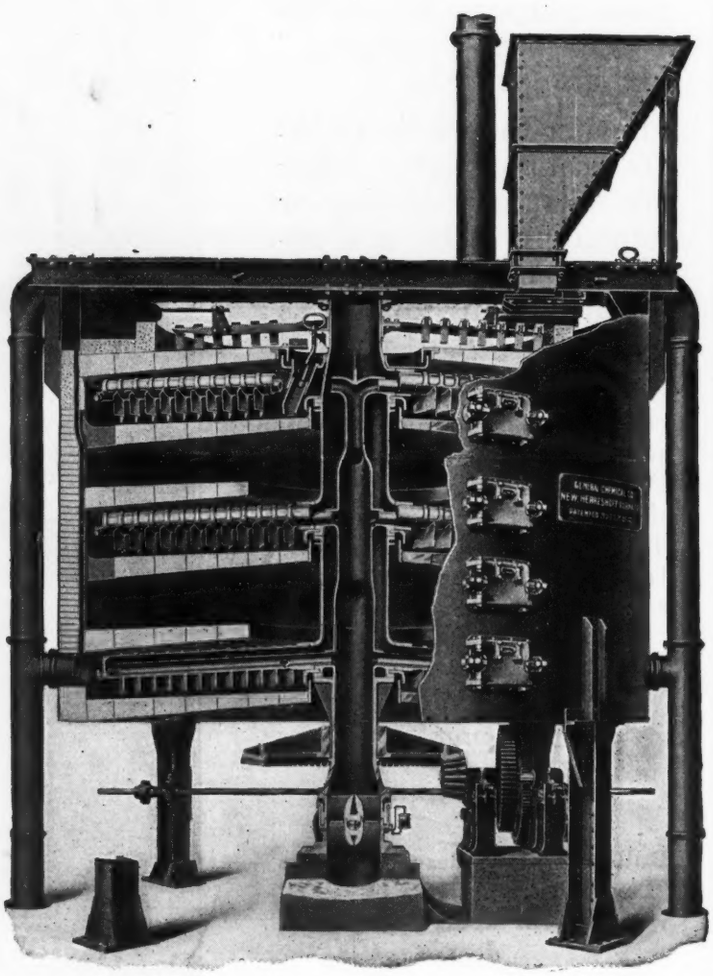
101-LJ

THE NEW HERRESHOFF FURNACE

(Patented)

Temperature Controlled — **For Roasting, Calcining and Drying** — Air Cooled

Write for Bulletin and state your Requirements



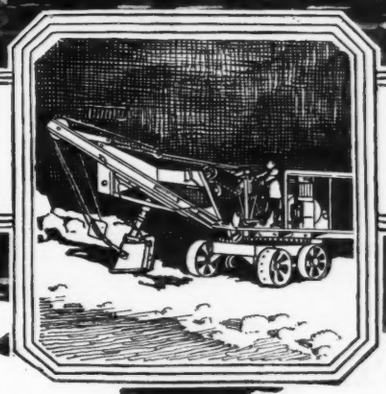
GENERAL CHEMICAL COMPANY

Herreshoff Furnace Department, 25 Broad St., New York

PACIFIC FOUNDRY COMPANY

Pacific Coast Agents, 18th and Harrison Streets, San Francisco, California

Strength



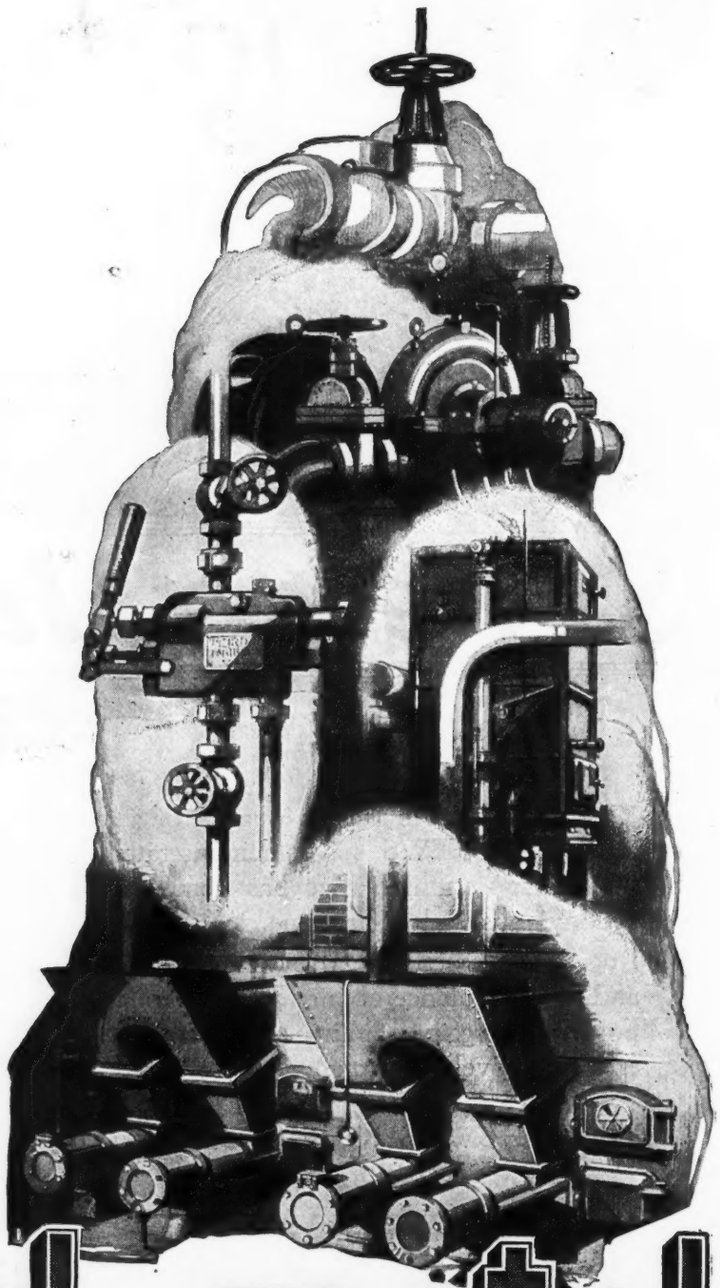
DURING more than a quarter of a century THEWS have demonstrated a "Gibralter" strength that has come to be synonymous with their name.

Rugged construction, with simplicity of design and perfect balance, obtains that dependable, powerful, digging ability so essential in efficient shovel performance.

THE THEW SHOVEL COMPANY
Lorain, Ohio

Thew
Power Shovels

Superheat



THE name Monel is given to a line of metal products produced by The International Nickel Company from a natural nickel alloy—67% nickel, 28% copper and 5% other metals. These products include Monel blocks, Monel rods, Monel castings, Monel wire, Monel strip stock, Monel sheets, etc. The name Monel identifies the natural nickel alloy as produced by The International Nickel Company.

INCo

MOnel metal

THE INTERNATIONAL NICKEL COMPANY

demands strong harness

IT chisels its way past and through otherwise proven "steam" metals.

Only Monel metal has been able to hold superheat to its work for only Monel is immune to the peculiar chemical and abrasive action of high speed gases.

This natural alloy combines the toughness of copper with the well recognized rust, wear and corrosion resistance of nickel. Its coefficient of expansion is identical with steel, its strength is fully its equal.

So we find Monel metal made standard for vital parts by leading valve manufacturers. It has a prominent place in the specifications of engineering firms of the standing of J. G. White, Stone and Webster, Dwight Robinson Inc., etc., where acid, alkali, high heat and steam-wear resistance are called for.

THE INTERNATIONAL NICKEL COMPANY
43 Exchange Place, New York
The International Nickel Company of Canada, Ltd., Toronto, Ontario

Machine parts

INCO MONEL METAL INCO NICKEL

THE INTERNATIONAL NICKEL COMPANY

Some Interesting Results with Telsmith Reduction Crushers—

NO. 2 TELSMITH REDUCTION CRUSHER—Maximum size of feed, 4½ in. cubes; minimum discharge opening, ½ in.; size of motor recommended, 20 H.P.; net weight, 13,600 lbs.; size of driving pulley, 36 in. x 12 in.; speed of driving pulley, 400 R.P.M.; hourly capacity with ¾-in. discharge opening, 12-16 tons; screen analysis on tough, close-grained black trap rock with 11/16 in. discharge opening (using Tyler's standard testing sieves) as follows: Retained on 1.05 in. opening, 3%; on .742 in. opening, 6.1%; on .525 in. opening, 15.1%; on .371 in. opening, 18.2%; on .263 in. opening, 12.1%; on .093 in. opening, 24.2%; on .046 in. opening, 7.6%; thru .046 in. opening, 13.7%.

The Telsmith Reduction Crusher is specially designed for re-crushing coarse rock to ½ in.—1½ in. sizes. The smaller machine, known as the No. 2, is built to follow a No. 4, 5 or 6 gyratory breaker or a jaw crusher up to 14 in. x 28 in. size. The data sheets, reproduced herewith, are based on actual measured capacities, ampmeter and screen tests.

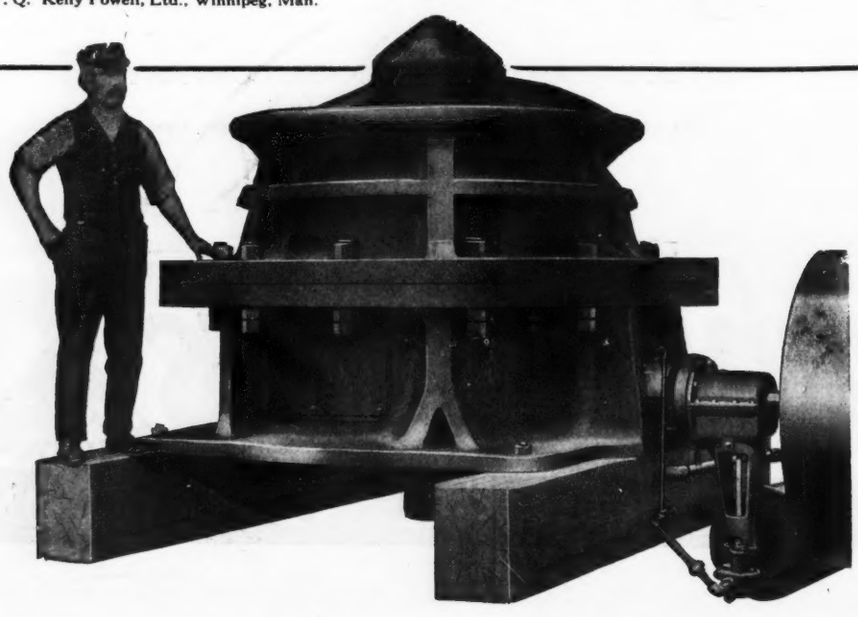
NO. 4 TELSMITH REDUCTION CRUSHER—Maximum size of feed, 7 in. cubes; minimum discharge opening, ¾ in.; size of motor recommended, 50 H.P.; net weight, 45,000 lbs.; size of pulley, 275 R.P.M.; capacity per hour with ¾-in. bottom opening, 50-60 tons; screen analysis on hard Wisconsin granite with 15/16 in. bottom opening (using Tyler's standard testing sieves) as follows: Retained on 1.05 in. opening, 12.5%; on .742 in. opening, 25.3%; on .525 in. opening, 22.8% on .371 in. opening, 10.9%; on .263 in. opening, 8%; on .093 in. opening, 9.5%; on .046 in. opening, 6.2%; thru .046 in. opening, 4.8%.

The No. 4 Telsmith Reduction Crusher (as shown in the picture below) is a massive re-crusher, built to follow a No. 8, 9 or 10 gyratory, or a jaw crusher up to 36 in. x 48 in. feed opening. It has a feed hopper big enough to take a gravity feed of coarse rock without hand or mechanical feed regulation.

Both machines produce their best results when choke-fed with a big column of rock above the crusher. Both discharge by gravity without centrifugal action. The crusher structure is short and heavy; the shaft rigid and absolutely unbreakable. The bearings are of large area with automatic lubrication. Glad to send you bulletin No. 2F1 (Telsmith Reduction Crusher) and catalog No. 168 (Telsmith Primary Breaker).

SMITH ENGINEERING WORKS
3195 LOCUST STREET, MILWAUKEE, WIS.

Old Colony Bldg., Chicago, Ill. 50 Church St., New York City. 710 Witherspoon Bldg., Philadelphia, Pa. 930 Oliver Bldg., Boston, Mass. 110 W. Park Way, N. S., Pittsburgh, Pa. 6110 Euclid Ave., Cleveland, O. 2540 University Ave., St. Paul, Minn. Franklin and Chaming Aves., St. Louis, Mo. 325 W. Main St., Louisville, Ky. Chester, Florida. 528 Boston Bldg., Denver, Colo. Salt Lake Hardware Co., Salt Lake City, Utah. 625 Market St., San Francisco, Calif. Old National Bank Bldg., Spokane, Wash. 617 Hollingsworth Bldg., Los Angeles, Calif. Brown Fraser & Co., Vancouver, B. C. Watson, Jack & Co., Montreal, P. Q. Kelly Powell, Ltd., Winnipeg, Man.



Gripping Power!

That red-frictioned surface of Copper Queen—what tremendous gripping power it has! Nothing less than remarkable—how its grip cuts down power wastage!

Nor do you want to forget the unusual *flexibility* of Copper Queen—a flexibility that adapts itself to sudden shocks and strains without a word of whimper.

Why use incompetent belting that means added strain on bearings, shaftings and hangers—added drain on power and fuel supply—added wear on machinery and equipment—when Copper Queen means greater ease, greater grip, greater power transmission!

Our 30 years' experience in making *Western belts for Western industries* is yours to use. Why not write our nearest office—today?

PIONEER RUBBER MILLS

[Formerly Bowers Rubber Works]

General Offices: San Francisco

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Dealers in principal mining districts of the world

PIONEER RUBBER MILLS U.S.A. P

Copper Queen Belting

"It promises after it performs"

AERO BRAND CYANIDE

Economical: Low delivered cost, ease of handling this flaky product, and reduced time required for settling and filtering solutions (due to coagulating effect on slimes) result in large savings in the course of a year.

Efficient: Aero Brand Cyanide is being used successfully on the widest variety of gold and silver ores, from the simplest to the most complex, with extraction efficiencies equal to the highest.

Dependable: Shipments of Aero Brand Cyanide have always been made promptly, as needed, without disappointment to a customer in four years.

American Cyanamid Company
511 Fifth Avenue, New York

A CASCADE OF STEEL BALLS

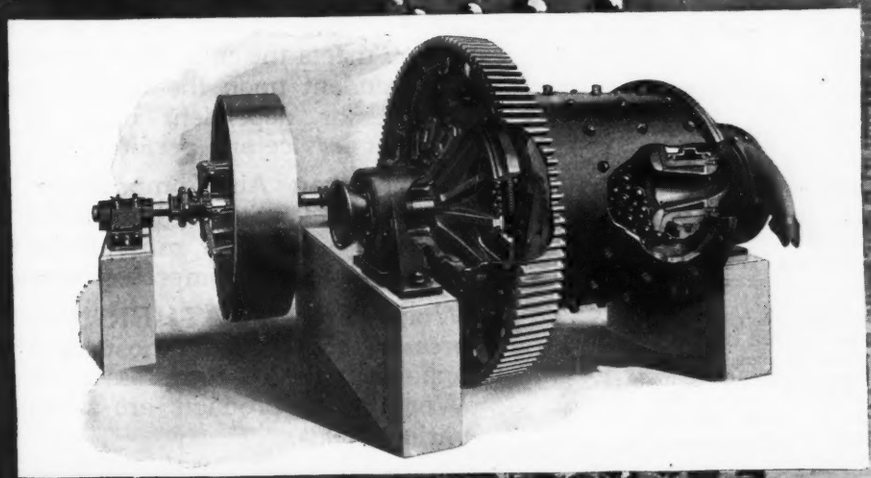
Grinding and pounding day after day and month after month is the actual condition inside a ball mill.

The rugged design, extra thick shell, heavy steel lining and first-class material, all of which feature

The Ball Granulator

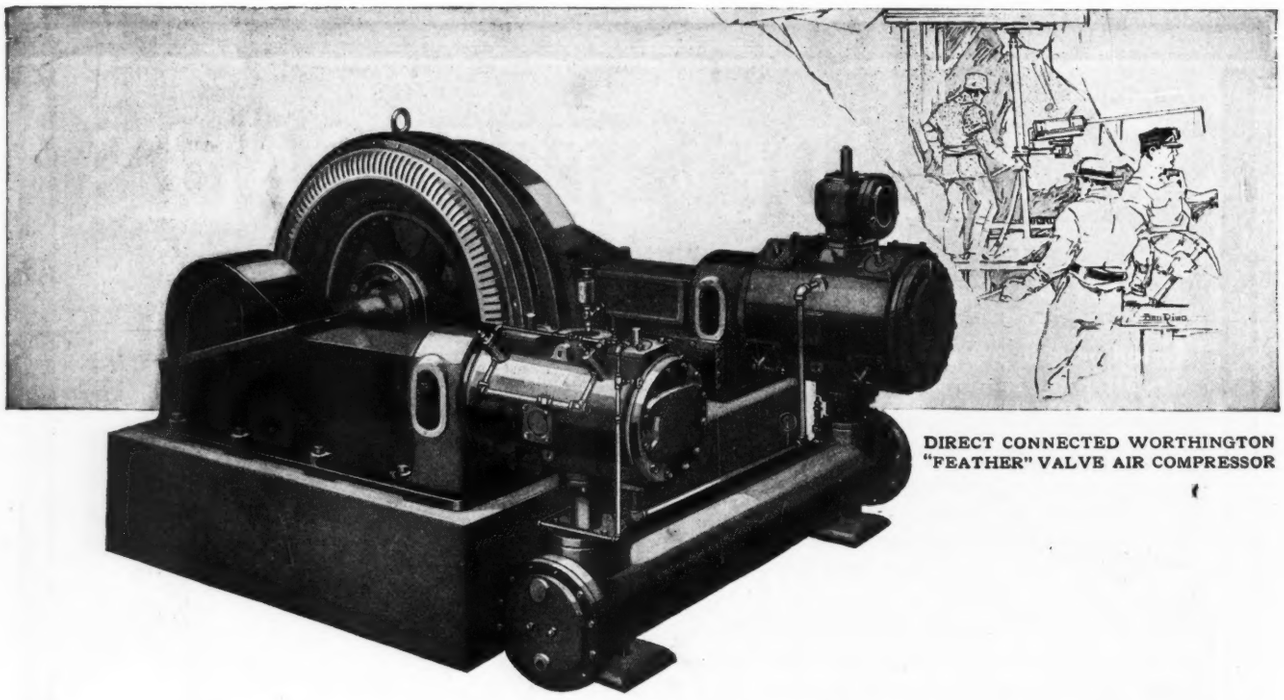
and minimize the destructive action of the STEEL CASCADE on the machine itself, making it the most durable installation where efficiency and continuous operation are first considerations.

MAY WE SEND YOU BULLETIN 1813-A



ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.



DIRECT CONNECTED WORTHINGTON
"FEATHER" VALVE AIR COMPRESSOR

Worthington "FEATHER" Valve Air Compressors

(Reg. U. S. Pat. Off.)

WHENEVER steady, always ready compressed air service is needed—Worthington meets the call. And as the line pressure is dependent upon the compressor, so is the compressor dependent upon its valves for efficient service and performance.

Worthington Air Compressors have been standardized with "FEATHER" Valves—the simplest, lightest, most efficient valve ever developed for air compressor work.

Worthington "FEATHER" Valve Air Compressors, then, are the most highly developed apparatus for air compressor work, even as Worthington products are standard in their various fields.

WORTHINGTON PUMP AND MACHINERY CORPORATION
Executive Offices: 115 Broadway, New York City
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Other Worthington Products:

Gyratory Crushers, Jaw Crushers, Air Compressors, Mine Pumps, Revolving Stone Screens, Ball and Tube Mills.

To further enlarge their service, Worthington have acquired the good-will and mechanical equipment of the Platt Iron Works, Dayton, Ohio, for manufacturing Oil Mill Machinery, Hydraulic Turbines, Feedwater Heaters and High Pressure Air Compressors.

W-374.8

PUMPS—COMPRESSORS—CONDENSERS—OIL & GAS ENGINES—METERS—MINING—ROCK CRUSHING & CEMENT MACHINERY

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Deane Works, *Holyoke, Mass.*
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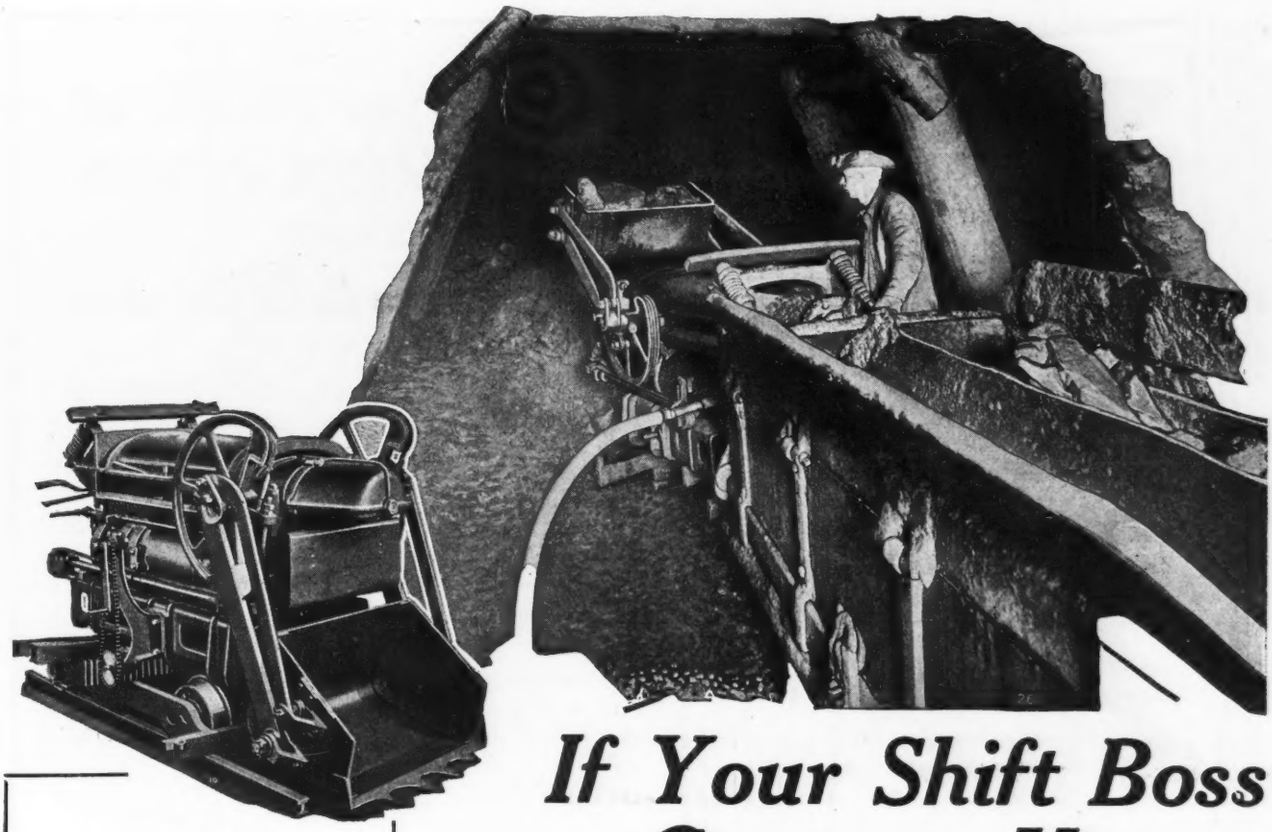
Gas Engine Works, *Cudahy, Wis.*
Power & Mining Works *Cudahy, Wis.*
Snow-Holly Works *Buffalo, N. Y.*
Epping-Carpenter, *Pittsburgh, Pa.*



If Your Shift Boss Came to You—

and pointed out that if the mucking gang didn't hold up the drilling crew he'd add 50 feet a month to his drifting advance—

Would it take much to convince you that it was time to reorganize mucking methods and put machinery to work for that gang?

That is just what you can do—and just where you can effect a great big saving in drifting cost.

You need the "Shuveloder" now.
It will do the work of four or five men and in half the time—count the saving for yourself.

Catalog 4-E tells the story in full.
Shall we send a copy to you?

Lake Superior Loader Company
Providence Building, Duluth, Minn.
Eastern Office, 150 Nassau St., New York

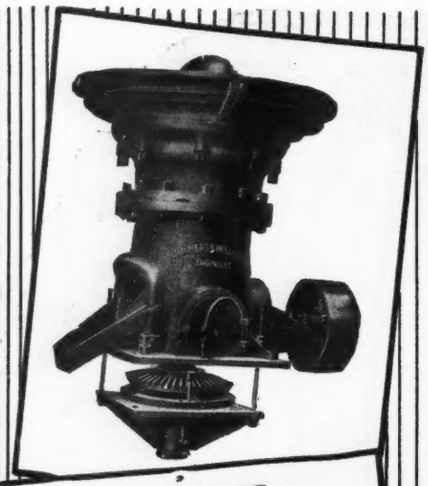
At the Anvil-Palms Mine, Bessemer, Mich., a time study showed that a Shuveloder with a three man mucking crew loaded 27 tons of heavy, earthy hematite in one hour of actual loading time. This with a new operator, running the machine only the second time.

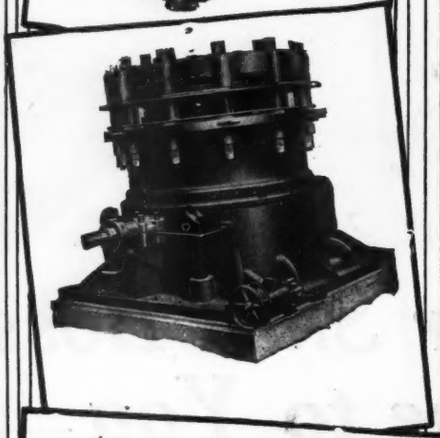
The detail figures of this time study throw considerable light on practical mechanical mucking. We will gladly send you a copy if you are interested.

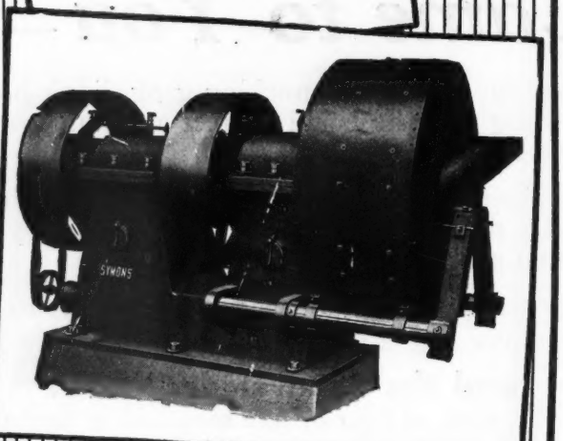
The Armstrong Shuveloder

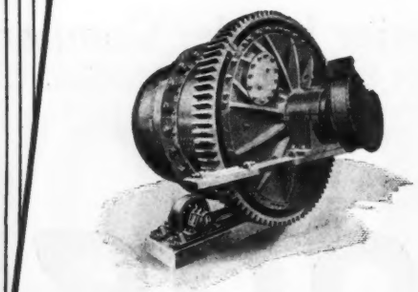
"Mechanize Underground"

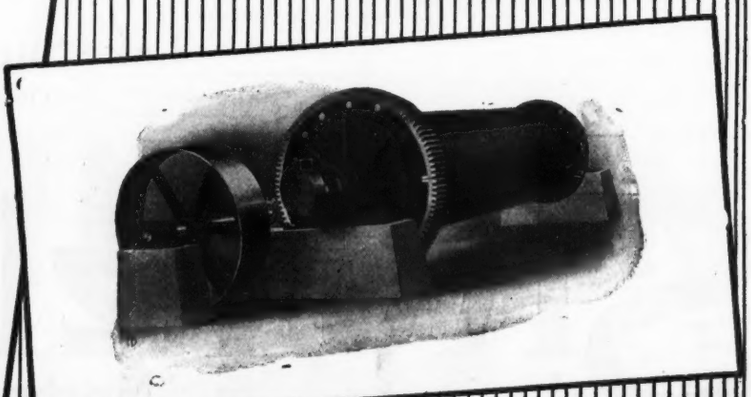
LS-38











When you think of ORE REDUCTION

consider

Chalmers & Williams

Why?

Because the firm of Chalmers and Williams designs and manufactures ore reduction equipment *exclusively* of all kinds—the old standard Blake and Dodge Jaw Crushers—Huntington Mills—Chile Mills—Stamp Batteries—Ball and Tube Mills—Gyratories and Symons Disc Crushers. We advise the equipment best suited to your needs in every case without the possibility of prejudice in favor of any one particular type of machine. What does this mean to you?—*satisfaction.*

Our *Gyratory Crusher* with phosphor-bronze ball and socket eccentric—*Symons Horizontal Shaft Disc Crushers* and *Symons Vertical Shaft Disc Crushers* for coarse and fine reduction, with manganese steel crushing members—our *Chalmers Ball Mill* and our *Quick Discharge Tube Mill* for wet or dry grinding—secure for you many little advantages that aggregate distinctive service.

Consult freely with our engineers.

Chalmers & Williams

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SEATTLE L. C. Smith Bldg.
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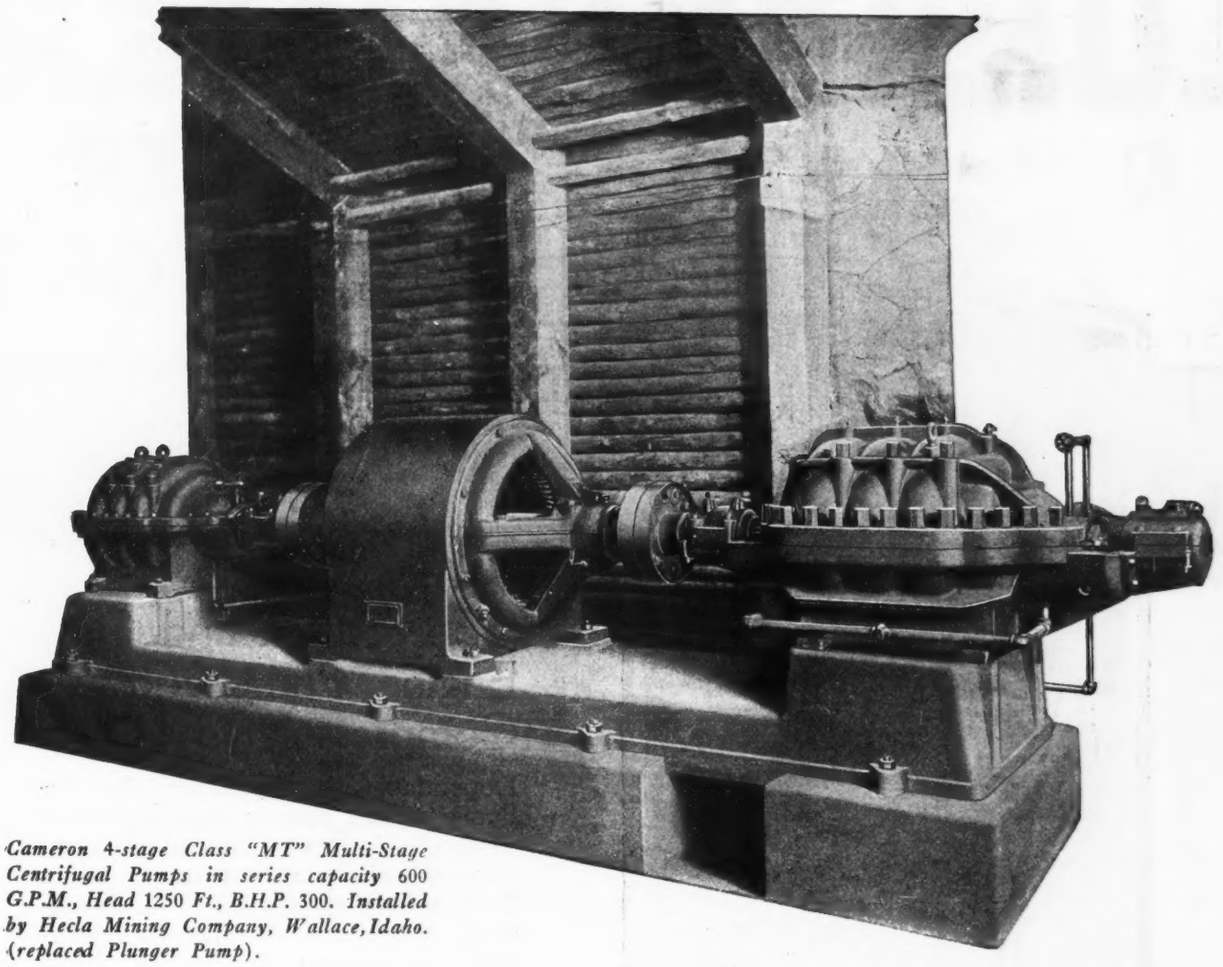


Cameron 4-stage Class "MT" Multi-Stage Centrifugal Pumps in series capacity 600 G.P.M., Head 1250 Ft., B.H.P. 300. Installed by Hecla Mining Company, Wallace, Idaho. (replaced Plunger Pump).

Cameron Turbine Centrifugal Pumps are available up to five stages, in a single casing. Where a greater number of stages is necessary to generate the desired head, it is advisable to accomplish this by series arrangement, consisting of two pumps of three, four or five stages each, so arranged that half the pressure is generated by the first group of stages in the first pump, and the remaining pressure by the second group in the second pump.

These pumps are arranged to be driven by motor or steam turbine. The series arrangement has the advantage of keeping the shaft distance between the bearings at a reasonable figure, and enables the second pump of the unit to be heavier in construction to withstand the maximum pressure. The number of stages required for a given head is dependent upon the limiting speed of the driver, the total head and the capacity desired.

A. S. Cameron Steam Pump Works

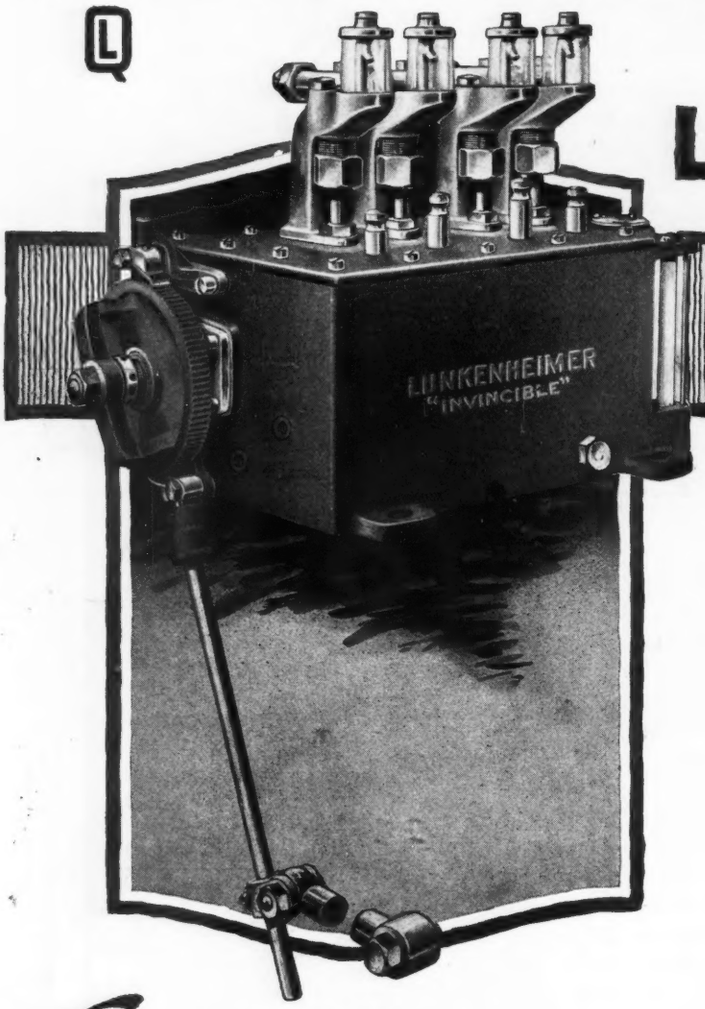
11 Broadway, New York

98-DV

CAMERON

LUNKENHEIMER

CYLINDER LUBRICATORS



AMERICA'S BEST
LUNKENHEIMER
"QUALITY"
SINCE 1862

For Steam and Oil Engine, Pump and Air Compressor Cylinders

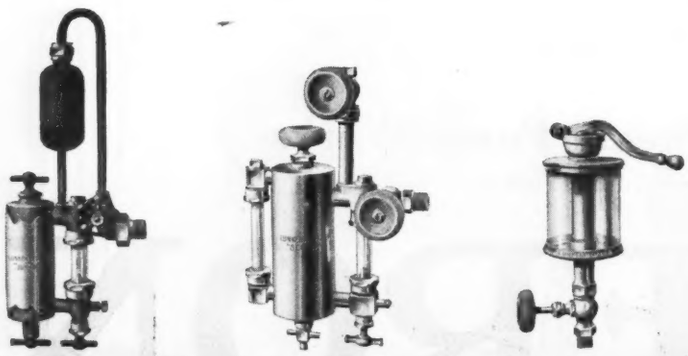
Dependable lubrication,—the delivery of the proper quantity of oil to the cylinders—is assured when power units are equipped with Lunkenheimer Cylinder Lubricators. They are positive in operation, delivering uniformly until reservoir is empty the exact quantity of oil for which the feed is set.

The feed regulation permits of close adjustment, the oil drops form perfectly and are clearly visible in the large sight-feeds. Lunkenheimer Cylinder Lubricators are made in a variety of types, including Hydrostatic, Hand and Mechanically operated,—practical in design, and durable because of the high quality materials used. All the parts are interchangeable and can be renewed should necessity require.

Equip with "LUNKENHEIMER" CYLINDER LUBRICATORS and satisfactory service is assured.

Write for descriptive booklets No. 526—BK. and 572—BK.

Their installation means permanence; their simplicity and durability—continuous service



THE LUNKENHEIMER CO.
"QUALITY"

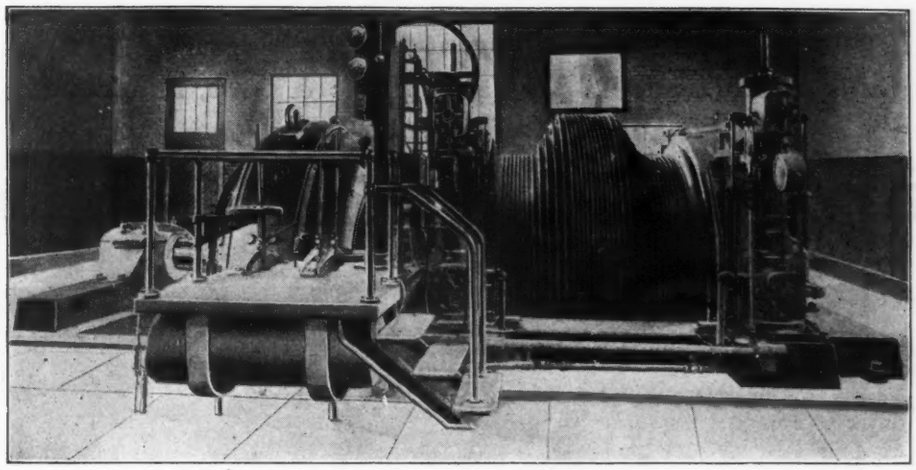
Largest Manufacturers of
High Grade Engineering Specialties
in the World

CINCINNATI

New York Chicago Boston London

22-14-20

VULCAN



VULCAN Cylindro-Conical Hoists

For great depths and large loads, hoists equipped with double cylindro-conical drums have proved to be the most economical type. The obvious advantage of this drum is that it reduces the starting load; the acceleration of the ascending cage occurs while the rope is winding on the small diameter. A very appreciable saving in power is thus effected, and a smaller motor may be used.

Then, too, with this type of drum less braking is needed to bring the cage to a stop; wear on the mechanical parts of the hoist is thus reduced to a minimum—lower up-keep cost and longer life results.

The illustration shows a Vulcan Hoist equipped with double cylindro-conical drums, typical of many installations throughout the bituminous and anthracite fields.

Tell us of the conditions which you wish to meet. For over seventy years we have been building hoists to meet widely varied requirements.

VULCAN IRON WORKS

"Established 1849"

1733 Main St., Wilkes-Barre, Pa., U. S. A.

VULCAN

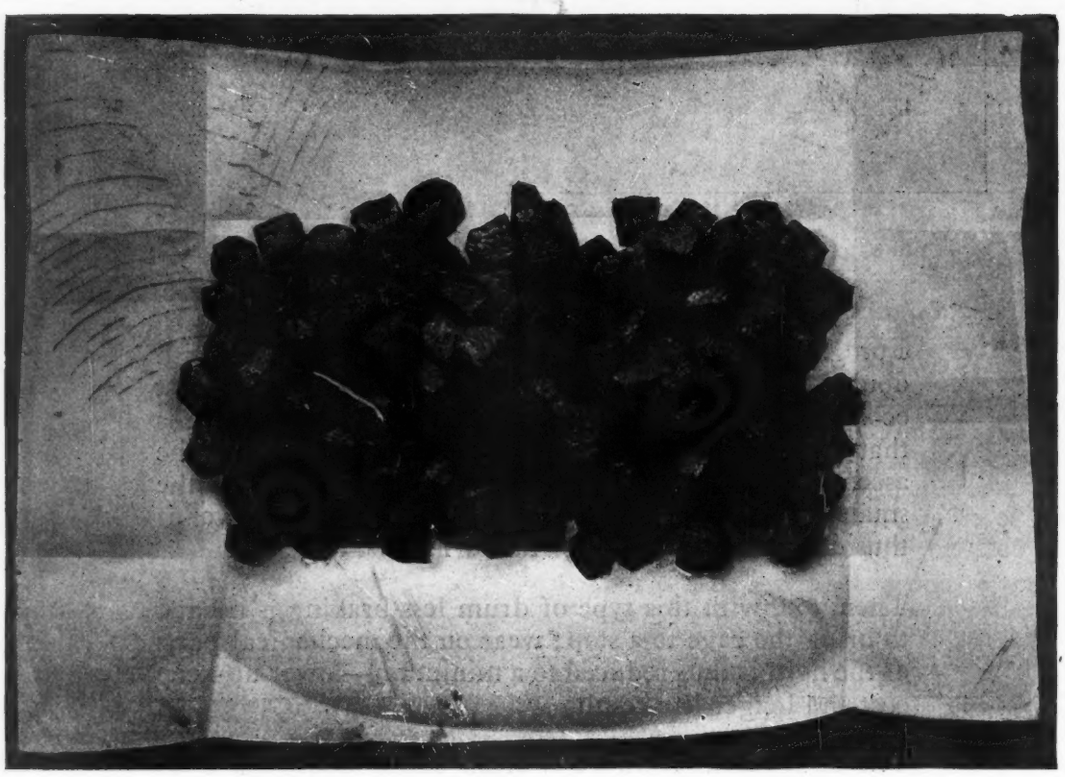
The S. Rose Company

1133 Broadway, New York

Selling Agents for

J. K. Gulland, Ltd., and L. M. Van Moppes & Sons, London, England

Carbons (Black Diamond) Bort



Just Received Another New Shipment

Fine Quality Carbon, Perfect Shapes
Also Ballas Bort

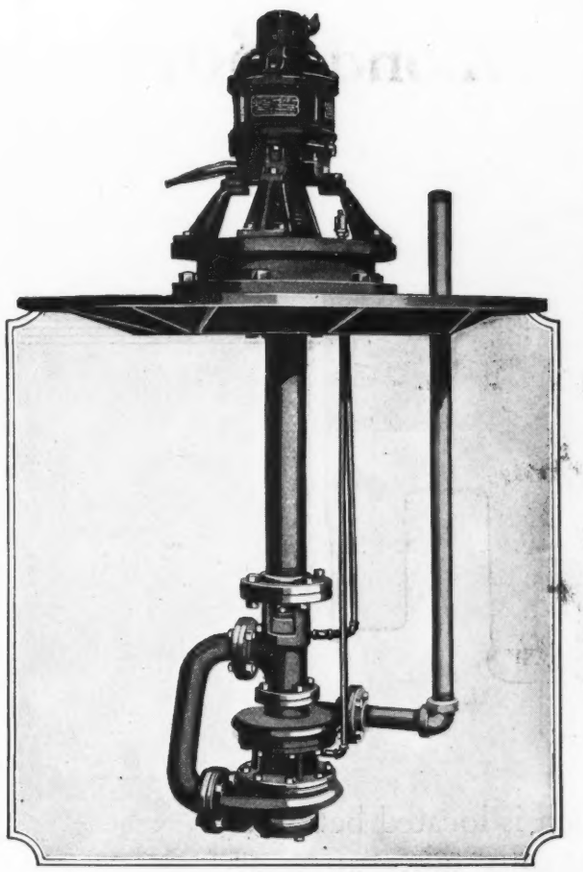
Will send quotations or parcels for examination if requested by wire, at our expense

Address Carbon Department

MIDWEST MECO METAL PUMPS

AN IDEAL ACID RESISTING METAL

FOR MINE PUMPS SUBJECT TO CORROSION



Meco Metal Pumps Are Made To Handle Acid Water

Meco Metal is a Perfect Acid Resisting Metal.

Sump pumps made of "Meco Metal" will solve the problem of getting a satisfactory pump to return acid water (or acid) to process tanks. These pumps combine acid resisting qualities with excellent design and highest economy.

Designed to meet the most severe operating conditions, they will give day in and day out service with the smallest amount of attention. Midwest "Meco Metal" pumps are made in suitable sizes to meet all conditions in this service.

Ask our Representatives for prices on "Meco Metal" Pumps.

As an indication of the acid resisting qualities of Meco Metal, we invite you to study this table of comparisons.

Rates of Corrosion (Inches Penetration Per Month)

% H_2SO_4	Meco Metal at 30° C. or 86° F.	Meco Metal at 45° C. or 113° F.	Lead at 30° C. or 86° F.	Lead at 45° C. or 113° F.
1	0.000155	0.000385	0.000380	0.000576
10	0.000158	0.000281	0.000257	0.000661
20	0.000134	0.000232	0.000537	0.000725
50	0.000035	0.000161	0.000631	0.000479
100	0.001865	0.002910	0.3160	0.7240
%HCl	at 25° C. or 77° F.	at 60° C. or 140° F.	at 25° C. or 77° F.	at 60° C. or 140° F.
2	0.000205	0.001535	0.00150	0.00640
20	0.001400	0.030400	0.00550	0.06600

MIDWEST ENGINE CO., INDIANAPOLIS, U. S. A.

Birmingham
Baltimore
Boston
Cleveland
Chicago
Denver
El Paso
Houston
Kansas City
Los Angeles
Little Rock
New York City
New Orleans
Philadelphia
Pittsburg
San Francisco
Salt Lake City
St. Louis
St. Paul
Seattle
Tulsa

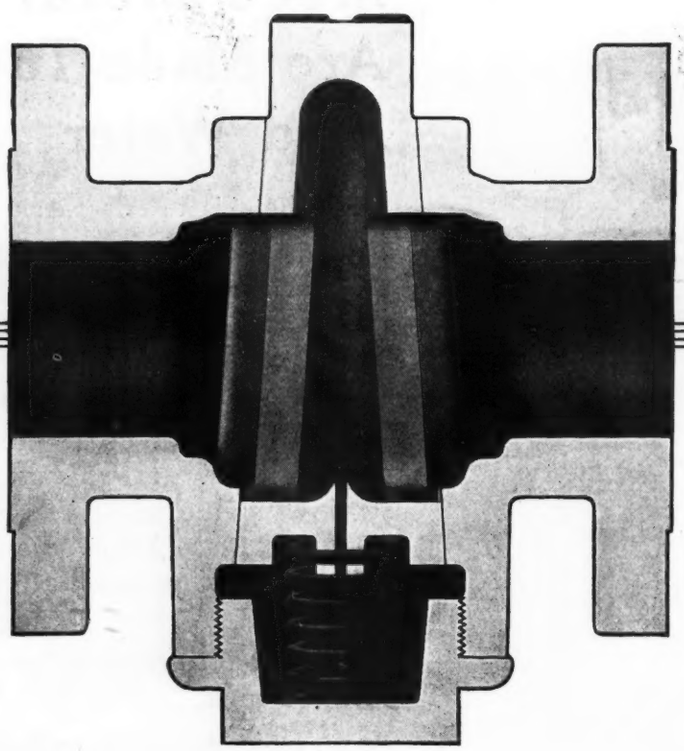
Dependable Power

CRANE

EXTRA HEAVY —— ALL IRON

Blow-off Cocks

with compensating spring complies with A.S.M.E. Boiler Code.



The Compensating Spring, which is located between the plug and the cap, automatically takes up wear and holds the plug securely in place at all times, thereby preventing the accumulation of scale, sediment, etc., which would tend to impair the ground bearing surfaces of the plug and body.

SALES OFFICES, WAREHOUSES AND SHOWROOMS:

BOSTON, SPRINGFIELD, BRIDGEPORT, ROCHESTER, NEW YORK, ALBANY, BROOKLYN, PHILADELPHIA, NEWARK, CAMDEN, BALTIMORE, WASHINGTON, SYRACUSE, BUFFALO, SAVANNAH, ATLANTA, KNOXVILLE, BIRMINGHAM, MEMPHIS, LITTLE ROCK, MUSKOGEE, TULSA, OKLAHOMA CITY, WICHITA, ST. LOUIS, KANSAS CITY, TERRE HAUTE, CINCINNATI, INDIANAPOLIS

CRANE LIMITED

MONTREAL, TORONTO, VANCOUVER, WINNIPEG, LONDON, ENG., SYDNEY, N. S. W., QUEBEC, HALIFAX, OTTAWA, CALGARY.

FOUNDED BY R. T. CRANE, 1855

CRANE CO.

836 S. MICHIGAN AVE.

CHICAGO

WORKS: CHICAGO AND BRIDGEPORT

DETROIT, CHICAGO, ROCKFORD, OSHKOSH, GRAND RAPIDS, DAVENPORT, DES MOINES, OMAHA, SIOUX CITY, ST. PAUL, MINNEAPOLIS, DULUTH, FARGO, WATERTOWN, ABERDEEN, GREAT FALLS, BILLINGS, SPOKANE, SEATTLE, TACOMA, PORTLAND, POCATELLO, SALT LAKE CITY, OGDEN, SACRAMENTO, OAKLAND, SAN FRANCISCO, LOS ANGELES

We are manufacturers of 20,000 articles—valves, pipe fittings, steam specialties, etc.—for all phases of power plant equipment, and are distributors of pipe, heating and plumbing materials.

What makes one wire rope far outwear another?

Wire ropes of the same type look alike, but one rope may last twice as long as another.

There are very good reasons for this.

Wire rope is ordinarily made up of six strands of either nineteen or seven wires each. When the rope is used for hoisting or hauling, the wires and strands rub against one another as well as against the pulleys, rollers and other objects.

The friction which arises from this internal rubbing is often as big a factor in the wear of the rope as the external friction and abrasion.

For this reason the twisting of the wires into strands and the *lay* of the strands as well as the internal lubrication are highly important. In a properly made wire rope, the wires and strands are so proportioned and laid as to minimize internal friction and provide amply for external wear. Careful provision has likewise been made for internal lubrication.

One of the reasons that HAZARD Wire Ropes have such unusual records of performance in service, is because they receive the careful attention to these three vital factors.

We have interesting evidence to show of the typical service of economy given by HAZARD Wire Ropes. Where shall we send you this story?

Hazard Manufacturing Company

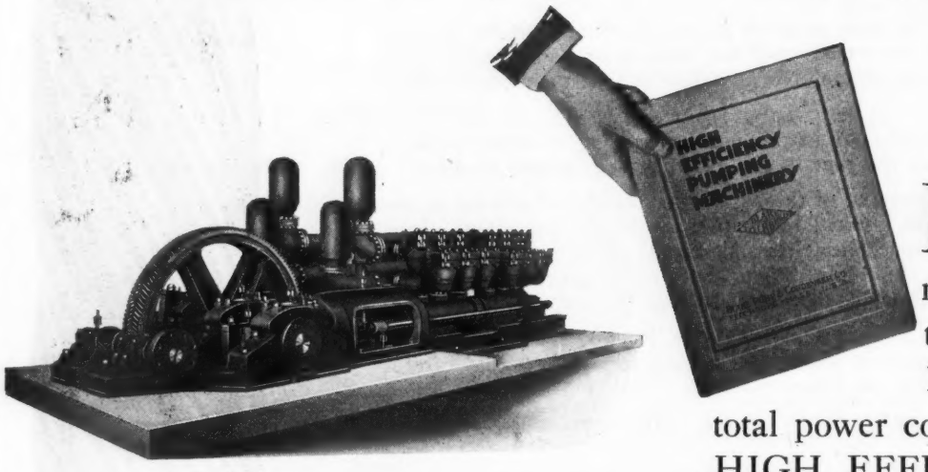
Makers of Quality Wire Rope since 1848

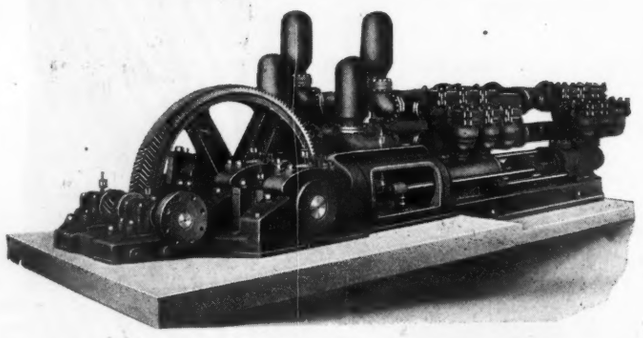
NEW YORK 533 Canal St. | CHICAGO 552 W. Adams St. | PITTSBURGH First Nat'l Bank Bldg. | DENVER 1415 Wazee St.

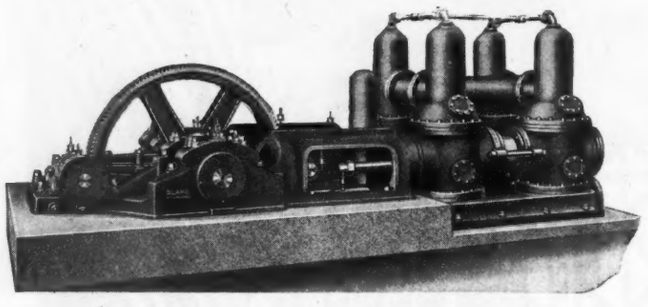
Wilkes-Barre, Pa.

HAZARD WIRE ROPE

Utmost efficiency







IF the wasted power does not lie within the range of 8 to 15 per cent of the total power consumed it is not HIGH EFFICIENCY.

The efficiency of any pump is determined by the relation of the amount of power applied to the amount delivered by it.

Perfect, or 100 per cent efficiency, is impossible, but proper designing, the use of first quality materials, careful workmanship and skillful operation will produce efficiencies within the range of 85 to 92 per cent.

Address nearest office for catalogue H-40 which tells a better story.

Blake Pump & Condenser Company

Fitchburg, Massachusetts

New York
Baltimore
Birmingham
Cleveland
Duluth

Philadelphia
Fitchburg
Houston
Kansas City
Los Angeles

BLAKE FITCHBURG

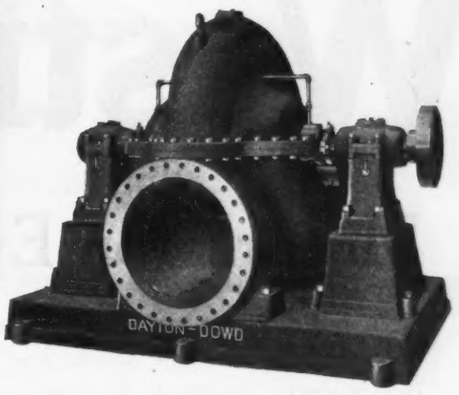
Boston
Minneapolis
Montreal
Richmond
San Francisco

Chicago
Toronto
Tulsa
Vancouver
Winnipeg

Any type—any head—any capacity

Applicable to any form of drive

SYRACUSE BABBITTS



Syracuse Babbitt is used in the bearings of Centrifugal Pumps made by the Dayton-Dowd Co., Quincy, Ill.

The difference
between one babbitt and another of the same grade is the way it is alloyed.

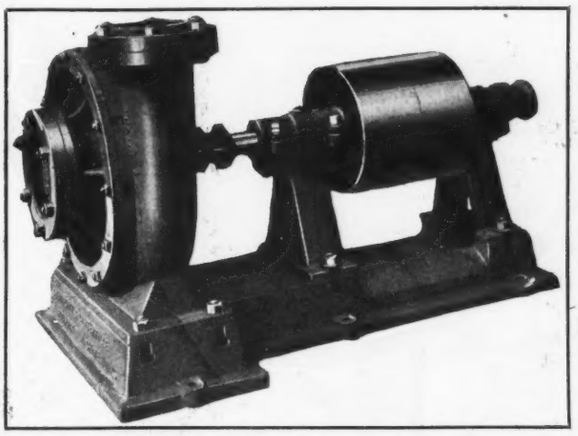
A babbitt skillfully alloyed insures you against bearing trouble that a babbitt unskillfully alloyed is sure to cause, such as running hot under normal stress or scoring the shaft.

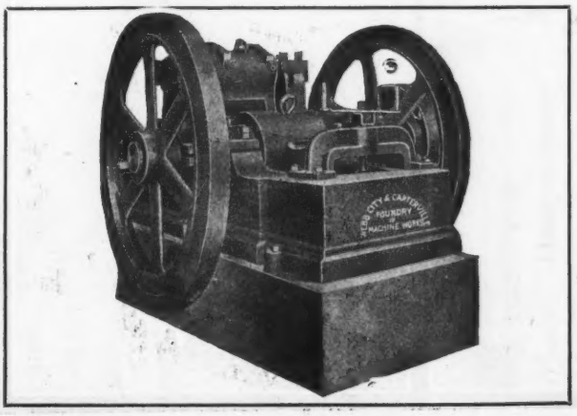
Syracuse Babbitts are alloyed with exacting skill and care.

Let us help you with your bearing problems.

United American Metals Corporation

Main Office and Works: Meserole Avenue and Diamond Street, Brooklyn, N. Y.
1011 Chestnut St., Philadelphia, Pa. **443 So. Dearborn St., Chicago, Ill.**





Two of our Products

BESIDES the products shown we are manufacturers of crushing rolls, revolving screens, jigs, elevator equipment and elevator buckets.

All our machines are made in a thoroughly modern plant and prompt and efficient treatment of all orders is assured.

We'll be pleased to quote you prices or send catalogs. Write.

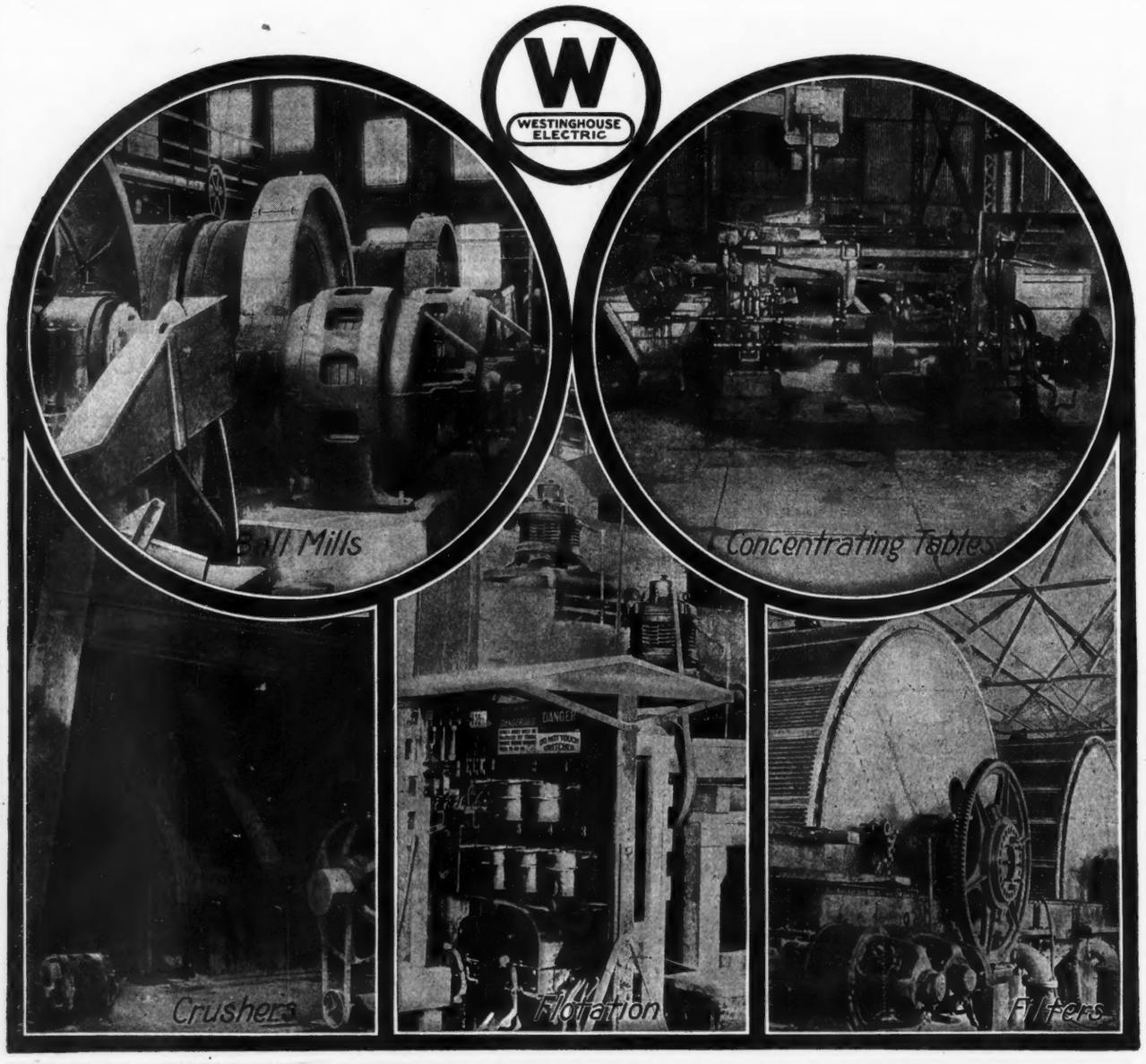
Webb City & Centerville Fdry. & Machine Co.
Webb City, Mo.

Westinghouse

Motors for Every Mill Requirement

In many cases an ordinary motor can be applied to do the work, but a motor particularly designed for the application will do it better, will be more efficient, and will require less maintenance. Many such Westinghouse motors have been developed and standardized for the various operations in metallurgical plants.

Westinghouse Engineering Service is at your command to determine the best motor drive for every process in your mill. Westinghouse Engineers will save you first cost, power costs, and costly mill interruptions.



The profit column of the industrial ledger shows a consistent gain when electricity is applied to material handling machines

The electrically operated Gantry Crane is without parallel for moving big loads within a short radius.

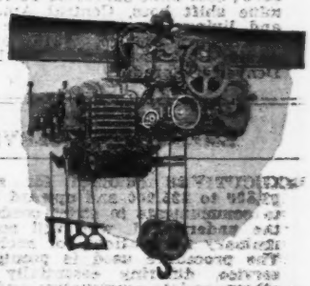
A Storage Battery Locomotive for quarry use.

Earn and save more with electric equipment

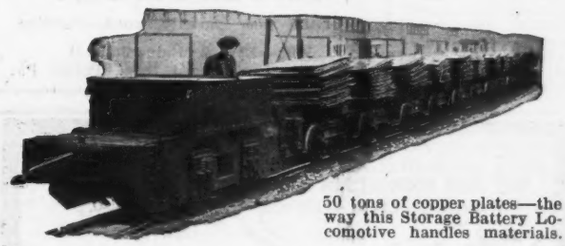
The problems of material handling in modern industry require up-to-date methods of solving them—electricity alone can keep pace with the times.

It has been demonstrated in numerous installations, some of which are illustrated herewith, that electrically operated and controlled equipment is the most flexible, most rapid of material handling machinery—and contributes reliability, economy and high efficiency to production, the receipt of raw goods and the shipment of finished products.

When you submit your material handling problems to a manufacturer of this equipment, *specify G-E Motors and Electric Control.* This insures you specialized service of General Electric Company engineers co-operating with the manufacturer in satisfying your individual needs.



Complete hoist equipment—electrically operated and motor driven trolley.



50 tons of copper plates—the way this Storage Battery Locomotive handles materials.

This locomotive is essential to the proper handling of materials in industrial yards

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

GEB-529

ENGINEERING & MINING JOURNAL

Think "SEARCHLIGHT" First

ADVERTISING RATES

POSITIONS VACANT—Business Opportunities and other undisplayed ads, 8 cents a word, minimum $2.00 an insertion.

POSITIONS WANTED—Evening work wanted, tutoring and other undisplayed ads of individuals looking for employment, 4 cents a word, minimum 75 cents, payable in advance.

ADD 5 WORDS for box number in undisplayed ads if replies are to any of our offices. There is no extra charge for forwarding replies.

DISCOUNT OF 10% if one payment is made in advance for 4 consecutive insertions of undisplayed ad.

ADS IN DISPLAY TYPE—Space is sold by the inch (30 in. to a page), the price depending upon total space used within a year, some space to be used each issue.

RATE PER INCH for ads in display space:
1 to 3 in., $4.50 an in. 15 to 29 in., $3.90 an in.
4 to 7 in., $4.30 an in. 30 to 49 in., $3.80 an in.
8 to 14 in., $4.10 an in. 50 to 99 in., $3.70 an in.

EMPLOYMENT

POSITIONS VACANT

POSITIONS WANTED

POSITIONS VACANT

CALIFORNIA laboratory supply house wants high-class man to take charge of department handling sales of chemical, physics and general scientific materials. Must have executive ability, pleasing personality and be a man who can accomplish things. Only one who has thorough commercial knowledge of line from mercantile standpoint and good executive and business training need apply. State age, if married or single and salary expected. Give record of experience with names of former employers. Address, James O. Sully, Agent, Newhall Building, San Francisco.

EMPLOYMENT AGENCY

FREE registration to graduate engineers who would accept $135 to $175. Positions secured promptly. Established 17 years. Wanted immediately: Assayer-chemist with platinum refinery experience, $175; cyanide shift boss, Central America, $150 and living; geological draftsman, Mexico, $200; coal mine surveyor, Colorado, $175; mine shift boss, Central America, $175 and living; master mechanic and chief electrician, Mexico, $275 and house. Apply Business Men's Clearing House, Denver, Colorado.

EMPLOYMENT SERVICE

EXECUTIVES qualified for salaries of $2,500 to $25,000 and upward are invited to communicate in strict confidence with the undersigned, who will conduct preliminary negotiations for such positions. The procedure used is peculiar to this service, differing essentially from all others, and is constructive and initiative, applied individually and in no way jeopardising present connections. Established 1910. Send name and address only for particulars. R. W. Bixby, Inc., 308 Lockwood Building, Buffalo, New York.

POSITIONS WANTED

COPPER smelter superintendent open for engagement. Will go anywhere, speaks Spanish. 16 years experience. Would accept position with opportunities. Best of references. Address, P. O. Box 841, Brawley, Cal.

DOCTOR—Single, sober, graduate Class A school; five months' post graduate work, three years' mining practice in Mexico; speaks Spanish. PW-82, Eng. & Min. Journ., Old Colony Bldg., Chicago.

GRADUATE mining engineer, age 36, married; 13 years' mining, exploration, development ore bodies. Willing to take temporary work on examination mining properties or permanent position as superintendent or chief engineer with responsible company; references. PW-92, Eng. & Min. Journ., Old Colony Bldg., Chicago.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
935 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents — send copies.

0195

POSITIONS WANTED

LEAD smelter superintendent or assistant superintendent available January; 13 years' practical experience, seven in Mexico, four in United States; technically trained; fluent Spanish; successful handler American and native labor; references; prefer United States or Canada. Would go to Latin America. PW-88, Eng. & Min. Journ., Old Colony Bldg., Chicago.

METALLURGICAL chemist, thoroughly experienced in rare metals and ferro-alloys; research and manufacturing experience. PW-83, Eng. & Min. Journ.

METALLURGIST with 20 years' experience in the smelting of lead is open for engagement; executive with record as a production getter. PW-85, Eng. & Min. Journ., Old Colony Bldg., Chicago.

MINING engineer, age 35, married; 15 years' experience mining, milling, quarrying, desires change; six years superintendent and manager large operations; thoroughly capable of exploration, surface and underground development, construction and operation; preferably Southwest. New York interview; available after two months' notice; minimum salary $6,000. PW-971, Eng. & Min. Journ.

POSITIONS WANTED

SUPERINTENDENT with 17 years' varied experience in mine development and operation; extensive work in placer mining, desires position; proven business ability; good executive; technical training. PW-91, Eng. & Min. Journ., Rialto Bldg., San Francisco.

WANTED

Maurice S. Dessau, 6 Maiden Lane, N. Y.,
Will pay highest prices for carbon (black diamonds) and Bortz fragments, also large and small used stones. Payment made return mail for merchandise purchased.

Used Carbon (Black Diamonds) and Bortz
And fragments wanted: Will pay highest prices. S. Dessau's Son, 180 Broadway, New York City.

WANTED

15-ton, 8-wheel, used

Locomotive Crane

in good condition, 50 or 54-ft. boom, 1½-yd. clamshell; prefer with magnet and generator set.

Address

Detroit Brass & Malleable Works
331 Holden Avenue, Detroit, Michigan

WANTED

COPPER CUPOLA

about 30 tons capacity, good condition.

W90—Eng. & Mining Journal
935 Real Estate Trust Bldg., Phila., Pa.

Geologists
Mine and Mill Supts., Foremen
Mine Surveyors
Assayer Chemists
Master Mechanics
Smelter Supts.
Metallurgists
Electricians
Draftsmen
Accountants

YOU WANT EXPERTS WE CAN FIND THEM
WE ARE EXPERTS IN OUR LINE – SECURING MEN
MINING – CIVIL – OFFICE – METALLURGICAL
BUSINESS MEN'S
CLEARING HOUSE
CHAMBER OF COMMERCE BLDG
DENVER, COLORADO.

FOR SALE

Gold and Silver Mining Claims

Buy direct from the prospector. Tom Saville, Sudbury, Northern Ontario, Canada.

EDUCATIONAL

COURSES—$30 in geology, ore mining, ore dressing, smelting and refining, hydrometallurgy, cost accounting. E. B. Wilson, Principal, Wilson's Correspondence Schools, Box 141 J, Scranton, Pa.

WANTED

Individual or party with capital to buy or assist in financing a gold copper property of 14 claims, located in Yavapai Co., Ariz. Joining the Zonia Syndicate on the north which is developing into a large copper proposition, and the Malapai Mining Co. a gold property on the south. Claims only partly developed but have surface showings to make a big mine, in practically a new district and the opportune time to get in as all indications point to the development of another large mining district. For details, map and samples, only to responsible parties address,

W. R. SHANAFELT
Kirkland, Ariz.

Valuable Molybdenite Properties

In centre of chief Molybdenite Mining District of South Norway. Two large ore bodies traverse the property. Extent and value of deposits proved. Mineral free from impurities and amenable to high-grade concentration. Property equipped with up-to-date plant and flotation units. Buildings solid and in good repair.

Property free from encumbrances, carrying right to use of roads.

BO86—E. & M. Journal
10th Ave. at 36th St., New York City

WANTED WANTED

$25,000.00

To further develop a first class copper property at Hope, Idaho.

We now own 360 acres of mineral land, have 600 feet of tunnel and cross cut. We have cut a vein of five to fourteen inches of high grade copper and a vein of three to four feet of mineralized quartz. High grade ore assays from $48.00 to $123.00 per ton.

Our surface discoveries are four leads showing lead, silver and copper; small stream of water running past portal of tunnel. Plenty timber; and transportation facilities are the best, 3400 feet from Northern Pacific Railway and Mountain States Power Company line.

For particulars write.

W. F. SHUTZ, *Fiscal Agent*
HOPE MINING & MILLING CO.
Sandpoint, Idaho

FOR SALE IN N. W. ONTARIO, CANADA.

Two groups of *Gold Claims* giving rich assays, near railroad station; plenty of wood and water. Also ten million tons high grade *Iron Ore* above ground. Patented process for making more and better Casinghead *Gasoline;* one right granted, royalty free.

Page, 16 State St., Rochester, N. Y.

JOHN BOYLE, JR.

PATENTS

Ouray Building, Washington, D. C.

16 years on the Examining Corps of the U. S. Patent Office

8,000 Stretchers

U. S. ARMY STANDARD

A Bargain

All new, surplus government stock. Complete with slings as shown.

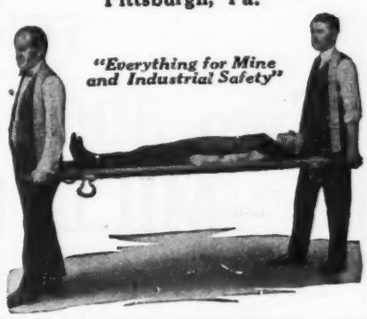
50% less than list price—lower than pre-war cost; lower we believe than they have ever been before offered. These 8,000 Stretchers are the last lot obtainable anywhere this season—this offer marks your last chance to take advantage of these prices.

1	Stretcher.....	$9.50 each
12	"	8.00 each
25	"	7.00 each
50	"	6.50 each
100	"	6.00 each

(Above prices f.o.b Pittsburgh)

MINE SAFETY APPLIANCES CO.

Chamber of Commerce Bldg.
Pittsburgh, Pa.



FOR SALE

SILVER MINING PROPERTY

In Austin, Nevada, consisting of approximately 1200 acres, one-half of which are patented. Last owned by Austin-Manhattan Consolidated Mining Co. Includes old mines of the MANHATTAN MINING CO., with record production of over TWENTY MILLION DOLLARS. None of the old mines are deep.

WM. A. MARSHALL
Resident Agent, Austin, Nevada.

A Study Mineral Collection

115 specimens, good sized, and each specimen with label adhered; every important mineral specie represented; the best mineral collection ever sold at the lo wcost of $28.50, delivered. Send for pamphlet. I buy choice mineral specimens of any kind; mineral collections for sale; mineral specimens any kind sold.

G. S. SCOTT, 20 Nassau St., New York

BOGUE SUPPLY CO.

New and Used Machinery
Mine, Mill and Smelter
Equipment

210 Felt Bldg., Salt Lake City, Utah

New Rails—Relayers

Cars, Locomotives, Steel Products

Send us your inquiries.

MERCHANTS STEEL & SUPPLY CO.
208 S. La Salle St., Chicago, Ill.

FOR SALE

GYRATORY CRUSHERS

from No. 18 down to No. 2. Jaw Crushers 84 x 108 down to 7 x 10. Pulverizers all types. Dryers, Screens, Elevators, Steam shovels, Locomotives, Cars, Rails.

J. F. DONAHOO CO.
Birmingham, Ala.

STEAM PUMPS

16 x 8 x 12 Knowles Single, capacity, 261 GPM.
14 x 10½ x 12 Knowles Duplex, capacity 409-313 GPM.
14 x 10 x 10 Deane Duplex, capacity 425-708 GPM.
12 x 7 x 12 Snow Duplex, capacity 269-461 GPM.
10 x 6 x 10 Snow Duplex, capacity 183-305 GPM.
8 x 8 x 12 Fairbanks Morse Duplex, capacity 417 GPM.
6 x 4 x 6 Fairbanks Morse Duplex, capacity 54-81 GPM.

OUTSIDE PACKED STEAM PUMPS

26 x 15 x 8 x 24 Knowles Compound Duplex Condensing Mine Pump with independent Air Pump and Condenser, pot valve type, capacity 500-700 GPM.
12 x 5 x 12 Snow, pot valve type, capacity 137-196 GPM.
10 x 14 x 16 Knowles Air Pump and Jet Condenser, condenses approximately 14½ GPM.
9 x 14 x 10 x 12 Smith Valle Duplex, capacity 816 GPM.

POWER PUMPS

Beidler Pump for Motor Drive, dia. plunger 6¼-in., dia. differential plunger 4½-in., stroke 24-in., capacity 350 gal. at 700-ft. head.
10 x 10 Deane Triplex, single acting, 150 lb. pressure, capacity 928 GPM.
9 x 10 Deane Triplex, single acting, 150 lb. pressure, capacity 346 GPM.
8 x 12 Gould Triplex, double acting, 150 lb. pressure, capacity 600 GPM.
5 x 8 Deane Triplex, double acting, capacity 182 GPM.
8 x 10 Deming Triplex, single acting, capacity 326 GPM.

SINKING PUMPS

10 x 7 x 5 x 10 Knowles, capacity 100 GPM.
No. 11 Cameron, capacity 261 GPM.
No. 9 Cameron, capacity 206 GPM.
No. 6 Cameron, capacity 65 GPM.
No. 5 Cameron, capacity 50 GPM.

MORSE BROS. MACHY. & SUPPLY CO.
Denver, Colorado

MACHINERY

LOCOMOTIVES

2—63-ton Mogul, 2-6-0 type, built by American Locomotive Works; 95 per cent new.

DUMP CARS

150—12-yd. Western & Oliver All-steel 2-way Dump Cars.
2—6-yd. Western 2-way Dump Cars.
50—1¼-yd. 20-in. Gauge Wood Body 2-way Dump Cars.

TANKS

15—Brand New Closed Storage Tanks, 6 ft. 9 in. wide, 10 ft. deep, 16 ft. 3 in. long; 7/16 in. plate.
25—Brand New Closed Storage Tanks, approximately 4 ft. 9 in. wide, 9 ft. 6 in. deep, 10 ft. 6 in. long; 7/8 in. material.
1—Horizontal Storage Tank, 10 ft. dia., 32 ft. long; capacity approximately 18,000 gal.
1—Steel Reservoir Tank, approxiately 13 ft. 4 in. dia., 37 ft. high; 7/16, ¼, 3/16 in. material.

WIRE

125 tons 13-gauge, black annealed.
500 tons 8½-gauge, galvanized.
400 tons 6-gauge, galvanized.
500 tons 1½-gauge, galvanized.
Write for Machinery List 308.

HARRIS BROTHERS CO.
35th and Iron Sts., Chicago, Ill.

FOR SALE

1—Set 42-in. by 16-in. Power & Machinery Co. Superior Rolls. (*Used* 30 *days only*)

6—3-ft. by 4-ft. Colorado Iron Works Impact Screens with extras. (*Used* 5 *days only*)

Extra 3-ft. by 4-ft. Ton Cap Screen of following sizes: Nos. 305, 55C, 469, 654.

Apply Sup't Pacific Coast Gold Mines Corporation
Quartz, Cal.

STEAM SHOVEL

Bucyrus 14-B No. 3376, full revolving, ¾-yd. dipper, mounted on caterpillar traction. Standard equipment A.S.M.E. boiler, new Spring of 1920. Used very little.

READING ENGINEERING CO., Inc.
Tribune Bldg., New York City

MACHINERY FOR SALE

AUTOCLAVES—One 120-gal. steel with stirrer; one 220-gal. lead lined; one 100-gal. high pressure.
CENTRIFUGALS—60, 45, 42 and 32-in. iron basket; 48, 40, 36, 32, 30 and 26-in. copper basket.
COOKERS—24 ½ x 7 ½ ft., 5 x 16 ft. and 3 x 16 ft. with stirrer and steam jacket.
CRYSTALLIZERS—One Buffalo, 300-gal. crystallizer.
DRYERS—Direct-heat Rotary Dryers, 3 x 25 ft., 3 ½ x 25 ft., 4 x 30 ft., 5 x 35 ft., 5 ½ x 50 ft., 5 ½ x 60 ft., 6 x 50 ft. and 7 x 50 ft.; double shell Dryers, 4 x 30 ft., 5 x 30 ft. and 6 x 35 ft.
Drum Dryers, 40 x 48 in., 5 x 12 ft. and 3 x 10 ft.
Steam-Heated Air Rotary Dryers, 4 x 30 ft., 6 x 30 ft.
Steam Jacketed Dryers, 5 x 15 ft., 4 x 7 ft., 3 x 16 ft. and 2 ¼ x 10 ft with stirrer
Rotary Vacuum Dryers, 4 x 10 ft., 5 x 30 ft. and 5 x 33 ft.
Vacuum Shelf Dryers, 20 shelf and 17 shelf.
EVAPORATORS—One quadruple effect with copper tubes; one double effect and one triple effect, all copper. One double effect, all iron, one double effect, copper tubes.
FILTER PRESSES—No. 850 Kelly; Nos. 20, 9 and 5 Sweetlands; 3 x 2 ft. and 11 ½ x 20 ft. Olivers; two 6 x 5 ft. and 4 6 x 3 ft. Industrial rotary Filters; one 4 x 4 ft. Industrial dewaterer, plate and frame presses of wood and iron.
HYDRAULIC PRESSES—600, 350, 200, 100 and 65-ton hydraulic Presses; one Anderson Expeller.
KETTLES—400-gal. Fusion Kettles, 50-gal. Jacketed Kettles, 300, 400 and 500-gal. Dopp Kettles.
KILNS—Rotary Kilns, 8 x 60 ft., 6 x 60 ft., 5 x 55 ft., 5 x 20 ft., 3 ½ x 25 ft. and 3 x 25 ft.
MILLS—20-in. Schutz-O'Neill; No. 18 American ring roll pulverizer; 24-in Coggswell Mill; No. 000 and No. 00 Raymond Mills; 3-roll Raymond Mill, 8 x 8 ft., 6 x 5 ft., 3 x 3 ½ ft. and 2 x 3 ft. pebble mills; 6 x 8 ft., 5 x 3 ½ ft., 5 x 4 ft., 4 ½ x 3 ½ ft. and 2 ½ x 2 ½ ft. Ball Mills; 3 ft. and two 8 ft. Marcy Mills; 42, 33 and 24-in. Fuller-Lehigh Mills; 4 ½ x 20 ft., 5 x 11 ft., 5 x 22 ft. and 6 x 20-ft. Tube Mills; 20 x 13 in., 30 x 16-in., 10 x 16-in., 9 x 12-in., 7 ½ x 13 in. and 7 x 10-in. jaw Crushers; one "Infant," one No. 0, one No. 2, two No. 3 and one No. 8 Williams' swing hammer Mills; one Kent type "G" Mill, two 36 in. and one 40-in. cage mills; two 4 ½-ft. and two 3-ft. Hardinge conical Mills; 18 x 12 in., 20 x 12 in. and 30 x 10 in. Roll Crushers; Nos. 0, 1 and 3 Sturtevant rotary Crushers; one No. 3 Telesmith Breaker; one 36-in. Sturtevant Emery Mill; one Griffin Mill; one 51 x 14-in. Chaser Mill; No. 1 Sturtevant ring Roll Crusher; No. 2 Mead Mill; one 24-in. "Monarch" Burr Mill.
MIXERS—One 1-ton acid phosphate Mixer; one 1-ton batch Mixer; ½-ton batch Mixer; ten 100-gal. W & P heavy duty jacketed Mixers; 150 and 60 gal dough Mixers
NITRATORS—1600 gal., 700 gal., 600 gal. and 350 gal.
RETORTS—Six Bunkast 3100-gal. Nitric Acid Retorts, 1500 gal. Acetic Acid Retort.
STILLS—Copper Stills and Iron Stills, with dephlegmators, condensers and fractionating columns; 16 to 60 in. in diameter for solvent recovery or alcohol or ether manufacturing; 500-gal. and 2000-gal. C. I. Stills with stirrers; 8 x 3-ft. beta naphthol Stills; 50-gal. copper Stills; 2000-gal copper vacuum pan, eight 300-gal. steel jacketed stills.
SPECIALS—One Complete Toluol Plant. One McDougal and one Wedge Mechanical Furnaces; five Automatic Package Weighing Machines Electric Arc Furnaces; Jigs; One drag line Excavator; 6 x 8 ft., 6 x 5 ft and 6 x 3 ft. Newaygo Vibrating Screens; one Leschen aerial Tramway automatic Cement Scales.
VACUUM PUMPS, DRY—8 x 16 x 12 in., 12 x 22 x 18; 12 x 12 in.; 6 x 6 in 5 x 4 in. **WET**—10 x 16 x 12 in., 10 x 14 x 18 in. **WITH JET CONDENSERS**—10 x 14 x 12 in., 8 x 14 x 12 in., 6 x 8 x 10 in.

All this equipment is complete and in good condition

W. P. HEINEKEN, *Engineer*, 95 Liberty St., New York City. Telephone Cortlandt 1841

Pulverizers

1—No. 5 Anderson 42 in.—Excellent.
2—Williams No. 4 Deck Sweepers.
1—42 in. Fuller Mill, Fan Discharge and many others.

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Have you seen our Big Bulletin ?
A copy sent on request.

Oil Engine and Generator

One 150 H.P. Type "RE", Fairbanks Morse Vertical. Same has just been overhauled by the manufacturer. *Can make immediate delivery.*

For information and price, address

WISCONSIN ZINC CO.
Platteville, Wisconsin

FOR SALE

Two 300-H.P. 500 Volt MILL MOTORS

Two Westinghouse 300-h.p. 345 to 500 r.p.m., 500 volt, D.C., compound wound motors, with one spare armature, including two Cutler Hammer, 300-h.p., 500 volt, D.C. Starters.

Condition good. Ready for inspection. Reason for selling, voltage changed. Write

H. LLEWELLYN, General Purchasing Agent

PITTSBURGH STEEL PRODUCTS CO.
Union Arcade Bldg., Pittsburgh, Pa.

Notice to Advertisers

Owing to the holidays "Searchlight" will close for press earlier than usual. Copy should reach us as follows:

January 1st Issue
Copy received up to
10 A.M. December 24th

NEW CENTRIFUGAL PUMPING UNITS

10—New Centrifugal Pumps, 3 in. to 12 in. direct connected to new 25 cycle motors. Immediate shipment.

ALUMINUM COMPANY OF AMERICA
2400 Oliver Building, Pittsburgh, Pa.

FOR SALE by the
CURTISS-WILLIS CO., INC.
30 Church St., New York City

1—Complete set of oil well drilling tools, including boiler and engine and derrick cost $12,000.00 last June and never used. Price as is 3½ miles from railroad station in Penna. $8000.00.

SOME ONE WANTS TO BUY

the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

SELL IT BEFORE DEPRECIATION SCRAPS IT

THE SEARCHLIGHT SECTION IS HELPING OTHERS
—LET IT HELP YOU ALSO

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56,250,000 LBS.

(The Total Surplus)

BRASS CARTRIDGE CASES

Analysis: 70% Copper, 30% Zinc
(Not warranted—read conditions of sale)

Size	*Length, In.*	*Amount, Lbs.*	*Location*
2.24 in.	12.09	526	Chicago, Ill.
37 m/m	3.64	360,250	Philadelphia, Pa.
75 m/m	13.82	5,711	Chicago, Ill.
75 m/m	13.82	44,944	Cincinnati, Ohio
75 m/m	13.82	6,130,361	New York
75 m/m	13.82	23,743,928	Philadelphia, Pa.
75 m/m	13.82	2,117,705	Rochester, N. Y.
75 m/m	13.82	94,625	Toledo, Ohio
3.00 in.	10.8	1,601,046	Baltimore, Md.
3.00 in.	10.8	97,894	Chicago, Ill.
3.00 in.	10.8	2,701,512	New York
3.00 in.	10.8	16,516,909	Philadelphia, Pa.
3.00 in.	10.8	709,823	Rochester, N. Y.
3.8 in.	7.34	28,031	New York
3.8 in.	7.34	225,000	Philadelphia, Pa.
4.7 in. Gun	16.6	680,966	Philadelphia, Pa.
4.7 in. How.	6.66	801,281	Baltimore, Md.
6.0 in.	9.93	490,509	Philadelphia, Pa.

This material may be inspected at points of storage. Apply:

Baltimore, Md.	Richmond Market Armory Howard and Biddle Sts.
Chicago, Ill.	74th and Ashland Ave.
Cincinnati, O.	Walsh Bldg., 3rd and Vine Sts.
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Philadelphia, Pa.	1710 Market St.
Rochester, N. Y.	1048 University Ave.
Toledo, Ohio	Toledo Storage Depot

Submit all bids to:
CHAIRMAN:
ORDNANCE SALVAGE BOARD
WAR TRADE BUILDING
WASHINGTON, D. C.

Conditions Governing This Sale

No bids will be considered for less than entire lot. Sold "as is" f.o.b. present location. Condition or analysis not warranted. Successful bidder, on notification of award must deposit cash or certified check for 10% of total amount. U. S. Government Bonds accepted at face value. All material must be paid for as removed either by sight draft with bill of lading or cash against shipping papers. Approved "bankers' acceptances" 30 or 60 days accepted.

Purchaser must remove and pay for not less than 3,000,000 pounds a month, all to be removed and paid for within one year.

Purchaser to accept certified weights submitted by U. S. representative at loading.

Weights given above are estimates, no guarantee as to amounts stated.

Government reserves right to reject any or all bids or any part thereof.

Bids considered for either:

(a) Outright purchase at a stated price.

(b) Purchase at percentage of market price to be adjusted monthly.

No propositions other than outlined above should be submitted at this time, except those under (a) bids will be considered for outright purchase, payments as removed, or total price in advance.

Bids will be received up to 12 o'clock noon,
(Eastern Standard Time)
Jan. 5, 1921

Jenkins Extra Heavy Iron Body Gate Valves

For 250 pounds working steam pressure, or 400 pounds working water pressure.

Double face, solid wedge type. Extra heavy and specially made to meet the requirements of heavy pressures and high temperatures in modern high pressure power plants.

Genuine Jenkins Valves are known by the name and Jenkins Diamond Mark cast on the body—they are obtainable through supply houses everywhere.

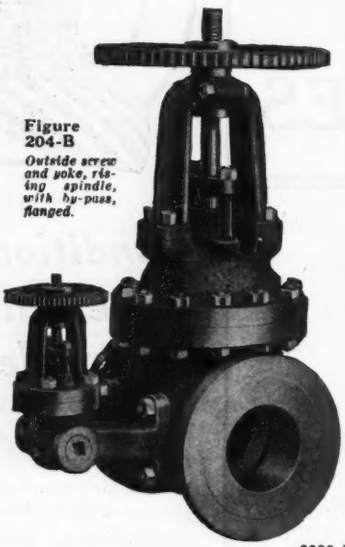

Figure 204-B
Outside screw and yoke, rising spindle, with by-pass, flanged.

2232-J

JENKINS BROS.

New York Philadelphia
St. Louis San Francisco
Chicago Washington
Boston Pittsburgh
Montreal London Havana

Jenkins Valves SINCE 1864

SMOOTH-ON ELASTIC CEMENT No3

Coat *All* Gaskets with SMOOTH-ON No. 3

An application of SMOOTH - ON ELASTIC CEMENT No. 3 to both sides of the gasket is **flange-joint insurance**—it never gives the leak a chance to get started. Order a can from your Supply House today.

SMOOTH-ON MANUFACTURING CO.
ESTABLISHED 1895
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Softeners & Filters

Iron and Oil Removal Apparatus—Filtration Equipment—Water Conditioning Apparatus of every description

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A rod packing made to give long satisfactory service even under hard conditions. Ask the engineer who uses "Palmetto" or send for working samples to test—no charge.

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are Specially Adapted to the Severe Service of
MINING MACHINERY
Write for Catalog.
THE GARLOCK PACKING CO., Palmyra, N. Y.
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The Knox Coupling
Abolishes leaks in air hose. A big improvement over the types. Prevents wear.

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Insures efficient control of your mining machines, drills, etc

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Knox Mfg. Co. 821 Cherry St., Phila., Pa.

For All Size Shafts Any Horsepower
Shafts Either In Line Or At Angle

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WE-FU-GO AND SCAIFE
WATER
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES
WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

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MANUFACTURERS OF
High Grade Silica, Chrome,
Magnesia, and Fire Clay Brick,
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HARDWOOD AND COAL TAR CREOSOTE
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Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS

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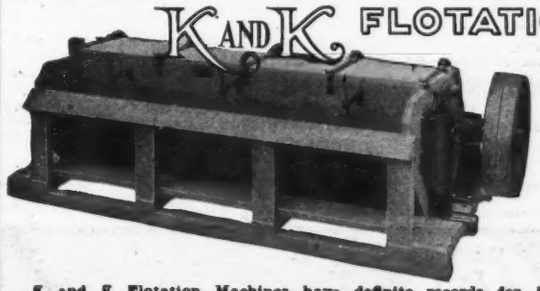
K AND K FLOTATION



K and K Flotation Machines have definite records for high recovery, low cost of operation and long life. In use by large and small companies everywhere.

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Manufacturers of

FLOTATION REAGENTS
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Trouble ahead—when you find that your last order for your favorite Flotation Oil cannot be duplicated.

Barrett Flotation Oils never fail you, every barrel is just as good as the last. Always uniform in high-grade quality—always available in any quantity you need.

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FILTER BAGS SPECIAL CLOTH FILTER COVERS
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"Standard" and "Little"
JANNEY
Mechanical Air
FLOTATION MACHINES

will get the last possible pound of mineral out of any ore amenable to flotation. The Janney patented circulating feature insures the highest degree of efficiency; it increases the time factor by building up a large circulating load that passes the ore pulp many times through the machine. This gives a maximum extraction with the fewest possible number of machines.

We make a specialty of testing ores by flotation. Send for illustrated booklets.

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STIMPSON EQUIPMENT CO.
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Standard "350" Crude and other PENTAR pine flotation oils. Used by leading American operators.

Manufactured and distributed by

Pensacola Tar & Turpentine Co.
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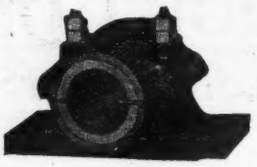
Heavy bearings,
Drop Hangers and
Post Hangers.
Machine moulded
gears and pulleys.
Friction clutches,
Rope drives and
Chain drives.



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DOES THE WORK OF FROM 6 TO 12 MEN
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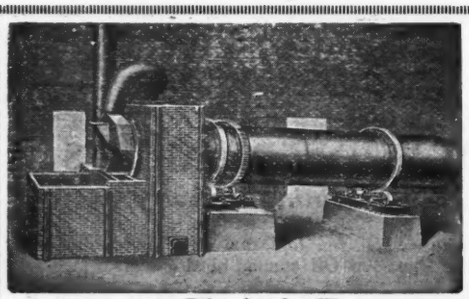

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Christie Dryers

Do save fuel—their design assures it. We have been dryer specialists for twenty-one years. Put your drying problems up to us.

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Automatic Improved **DRYERS** For All Materials
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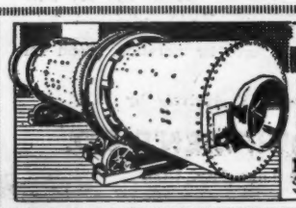
Complete Power Plants

Boilers, Engines, Condensers, Pumps, Hoists, Compressors, Heaters, Purifiers, Valves and all Power Plant Auxiliaries.



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Every Dryer built with 27 years' experience behind it. Easy to operate, efficient and continuous. Made in eight distinct types and all sizes. Write for our illustrated catalog and submit your troubles.

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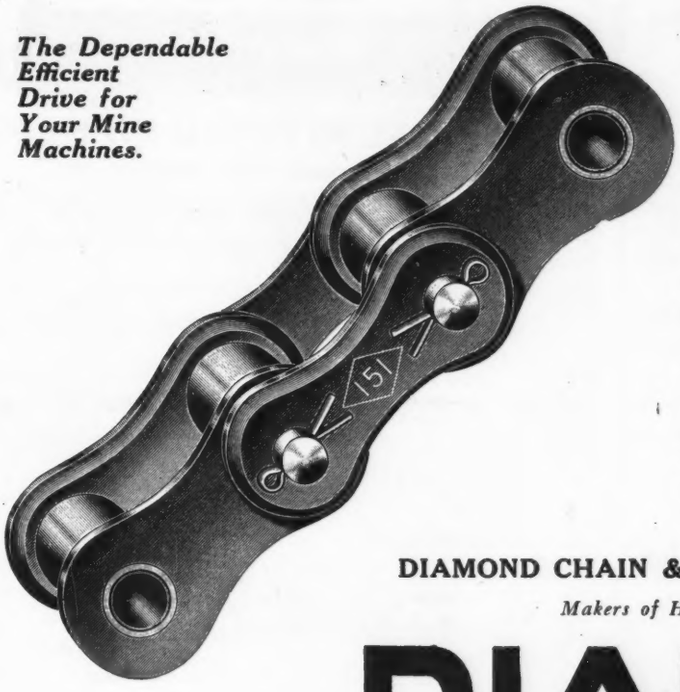
Address all communications to Research Corporation, Attention of Commercial Department.

The Dependable Efficient Drive for Your Mine Machines.



Positive Power Delivery

The drive you need for mine machinery is one that maintains positive speed ratio between driving and driven shafts, yet is flexible enough to absorb the shocks of mining service.

Diamond Chain Drive does these two things—and more. Built of special steel, accurately machined and carefully tested, it gives efficient, dependable service at low cost and is long-lived.

This durable drive is adaptable to the mine machinery you make or use. Tell us your power transmission needs and our engineers will give you their recommendations.

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Makers of High Grade Chains Since 1890

DIAMOND CHAIN ◇ DRIVE

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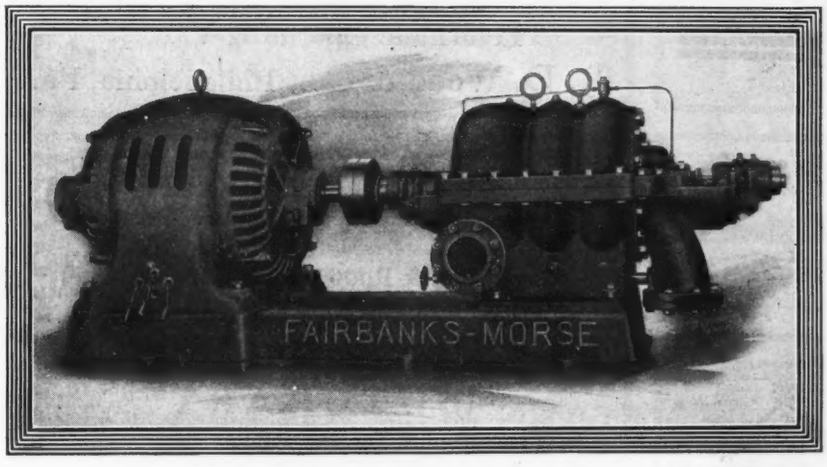

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This Fairbanks-Morse motor driven, multi-stage centrifugal pump is adapted for mine drainage and similar service against heads up to 500 feet.

Bronze wearing parts—easily renewable—quickly opened for inspection without disturbing piping connections.

Fairbanks-Morse ball bearing motors have solid rotor winding, rigid cast frame and ball bearings packed in grease.

Fairbanks, Morse & Co.

MANUFACTURERS CHICAGO

The Canadian Fairbanks-Morse Co., Ltd., Montreal

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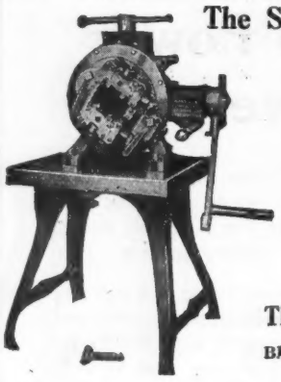
Oil Engines - Pumps - Electric Motors and Generators - Fairbanks Scales - Railway Appliances - Farm Power Machinery



The Same Dependable Dies

that have for a quarter of a century given such satisfaction in Genuine

ARMSTRONG

Stocks are used in the Nos. 0 and 00 Armstrong Pipe Threading and Cutting-Off Machines. All dealers carry them. Send for complete catalog including prices of repair parts on these perfect machines.

The Armstrong M'f'g Co.
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TAYLORS SPIRAL RIVETED PIPE

SPIRAL RIVETED PIPE
with forged steel pipe connections
LIGHT—STRONG—DURABLE
Extensively used for high pressure lines
Catalog and special prices on request
AMERICAN SPIRAL PIPE WORKS
CHICAGO, ILL.

The productive efficiency of mill or mining plant depends largely upon its tanks.

Pacific Wood Stave Tanks

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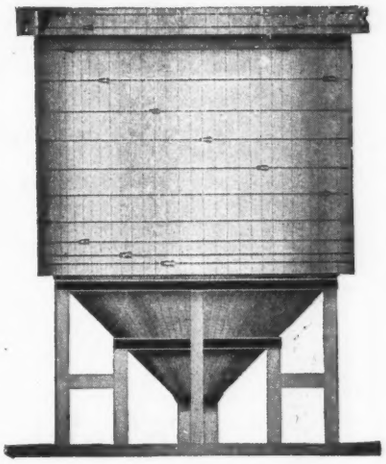

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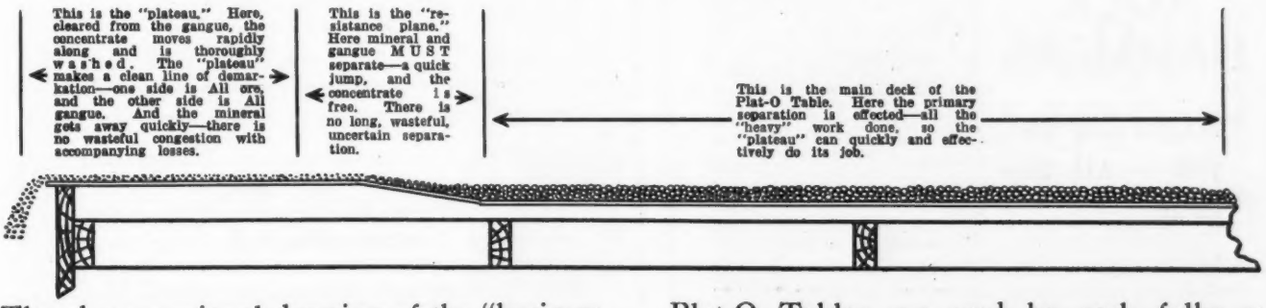
Plat-O Concentrating Table


This is the "plateau." Here, cleared from the gangue, the concentrate moves rapidly along and is thoroughly washed. The "plateau" makes a clean line of demarkation—one side is All ore, and the other side is All gangue. And the mineral gets away quickly—there is no wasteful congestion with accompanying losses.
This is the "resistance plane." Here mineral and gangue MUST separate—a quick jump, and the concentrate is free. There is no long, wasteful, uncertain separation.
This is the main deck of the Plat-O Table. Here the primary separation is effected—all the "heavy" work done, so the "plateau" can quickly and effectively do its job.

The above sectional drawing of the "business end" of a Plat-O Table is meant especially to show the "resistance Plane" and the Plateau itself. These are patented, and are the factors which enable Plat-O Tables, size for size and condition for condition, to handle more feed than any other table, and with less attention.

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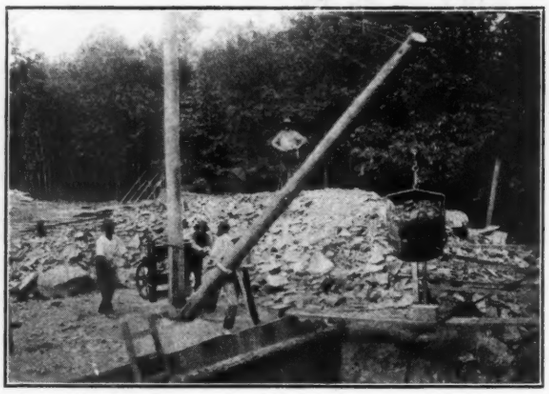

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Longyear crews go everywhere. Longyear geologists point out where to explore—surveyors locate drill holes—drillmen bore the holes and obtain accurate samples—workmen sink the shaft, install and erect equipment and turn the property over to you ready to operate. In other words, Longyear Service is *Complete* Service. It saves time and money all along the line. *Write for further information.*

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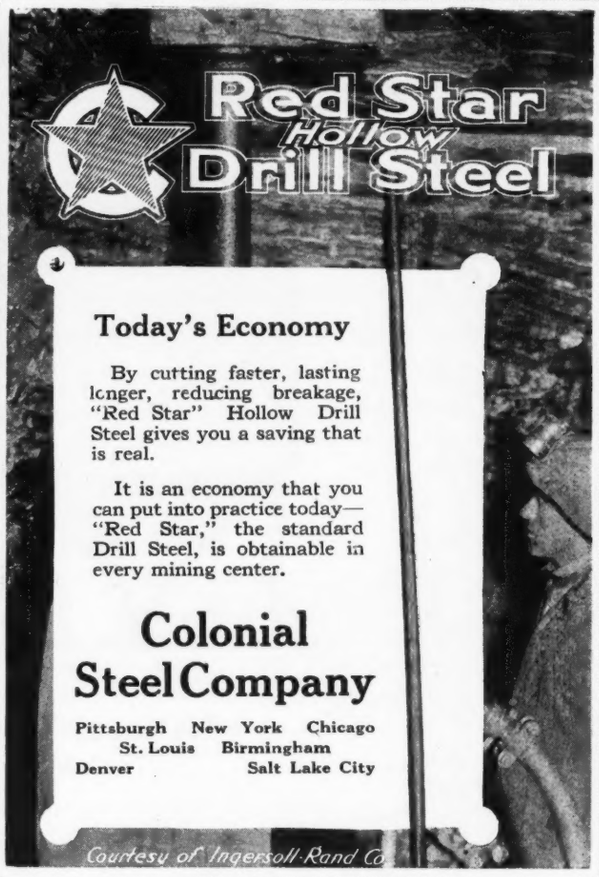

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It is an economy that you can put into practice today—"Red Star," the standard Drill Steel, is obtainable in every mining center.

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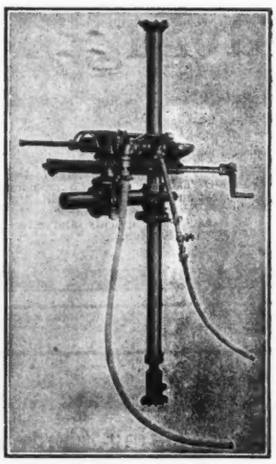

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that's what the superintendent of a Nevada mining company says--there's a message for you in his letter—read it.

"Dear Sirs:—

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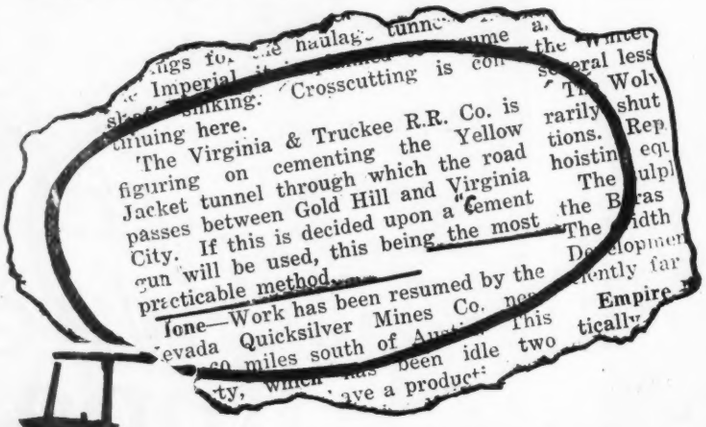
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passes between Gold Hill and Virginia
City. If this is decided upon a cement
gun will be used, this being the most
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Work has been resumed by the
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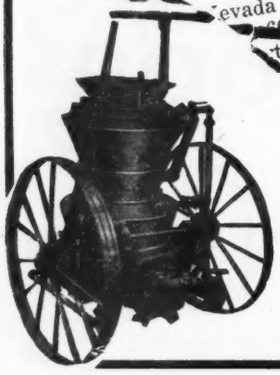

This article, from a recent issue of Engineering & Mining Journal, is but another indication of the regard in which the "Cement-Gun" is held. You will note that the only uncertainty relative to this concrete work is the job itself—there's none regarding the method of applying the cement.

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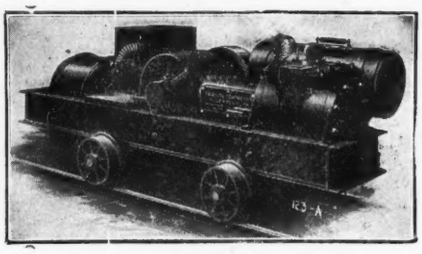

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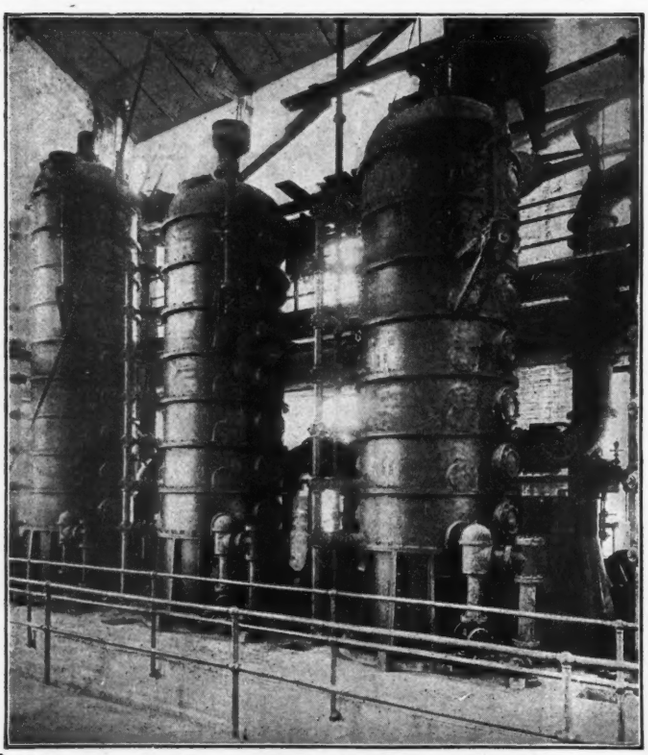

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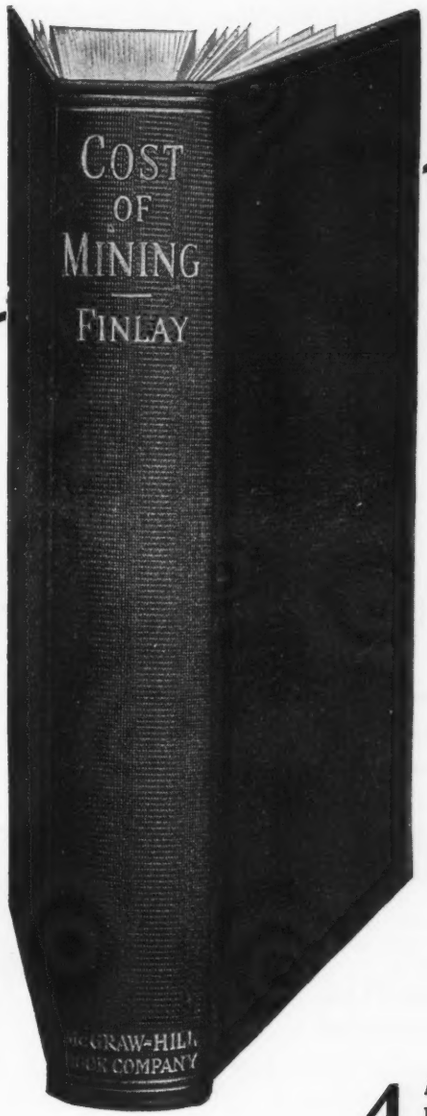

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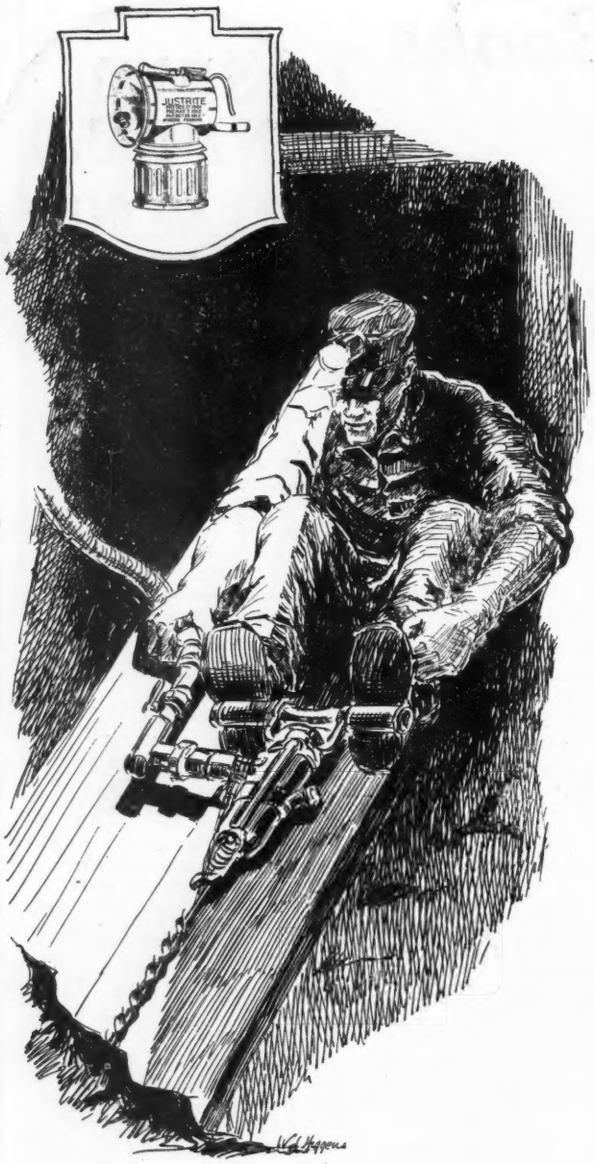

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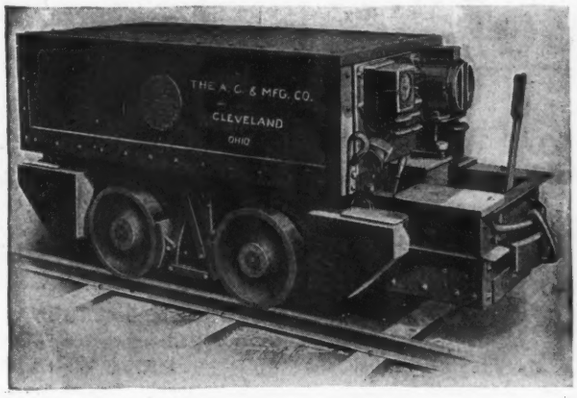

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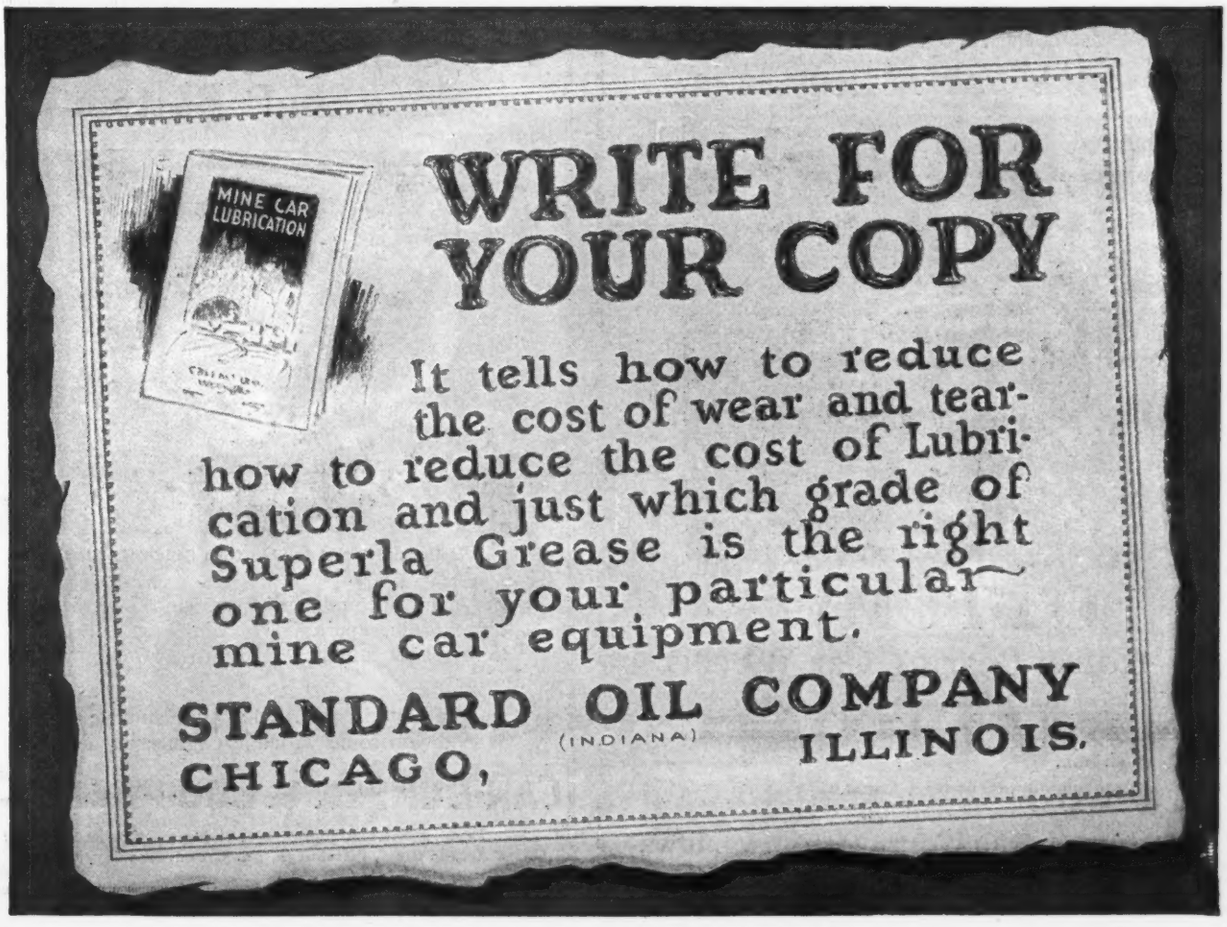
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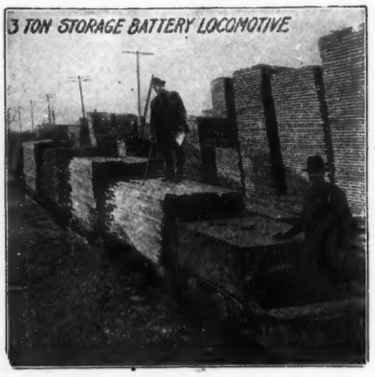

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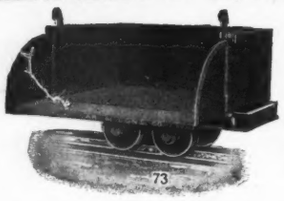

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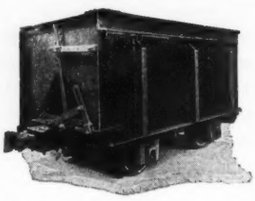

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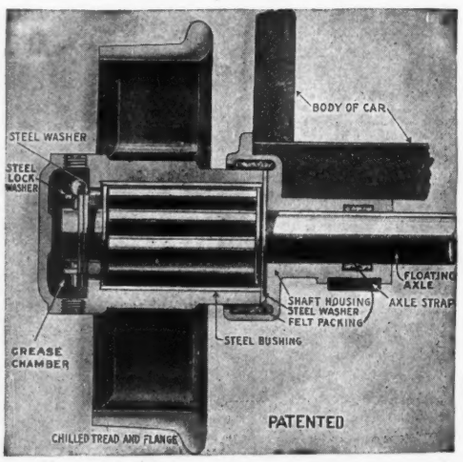

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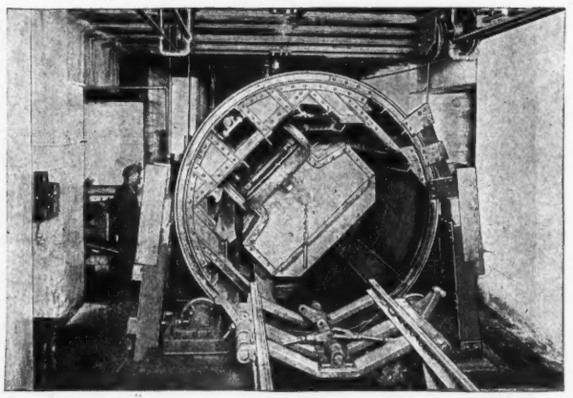

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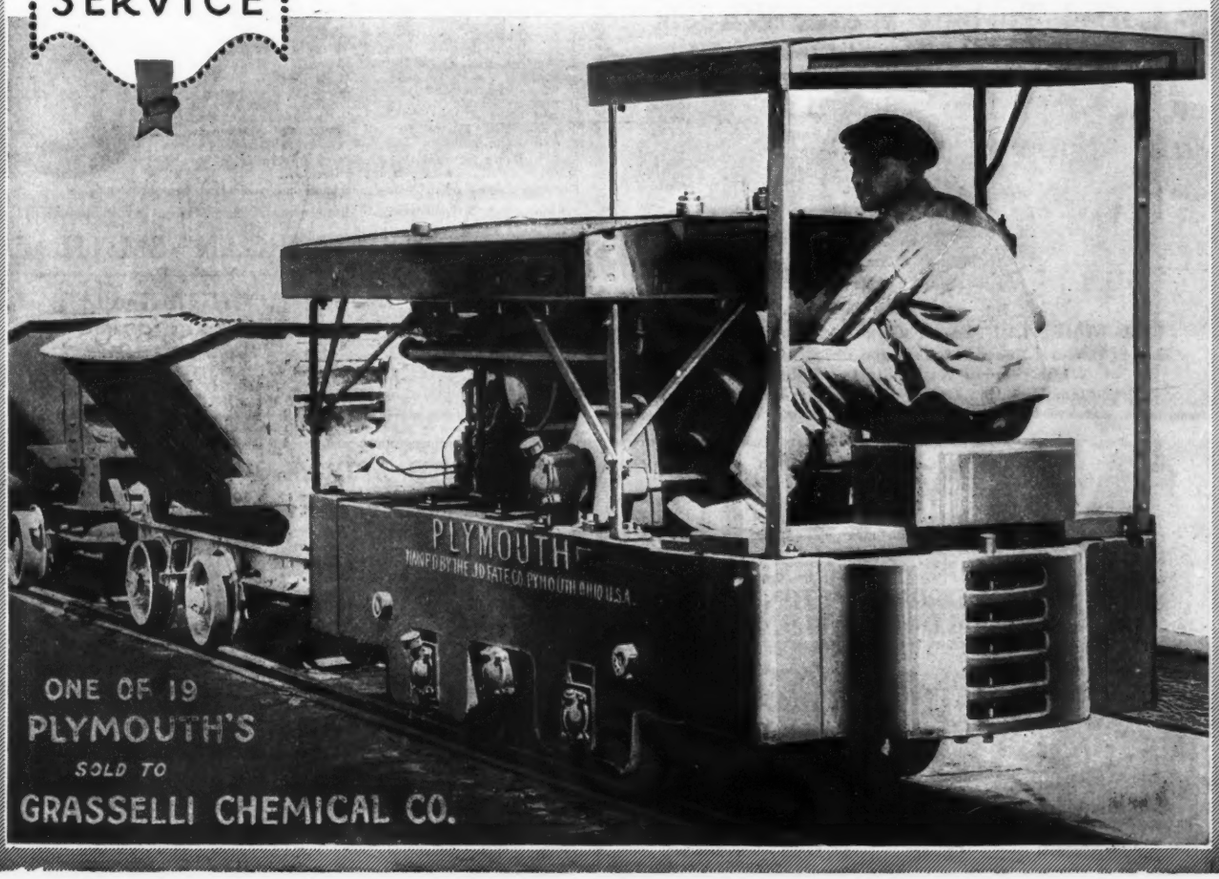

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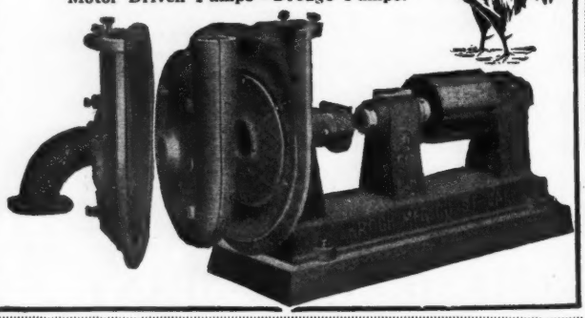

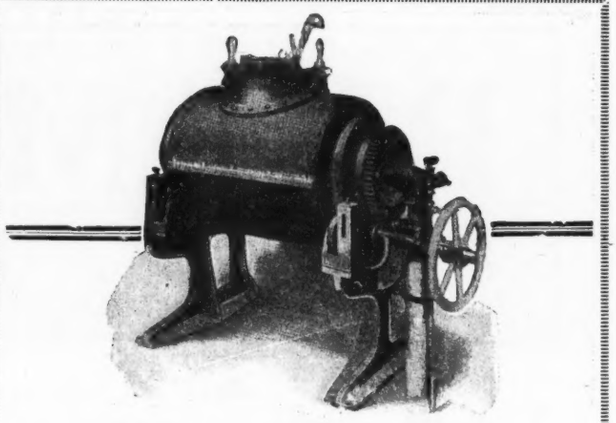

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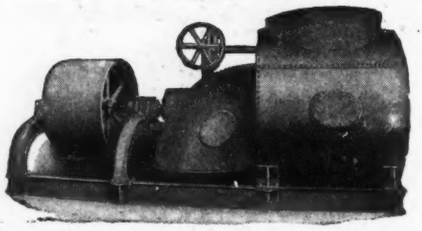

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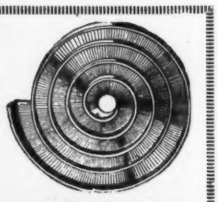

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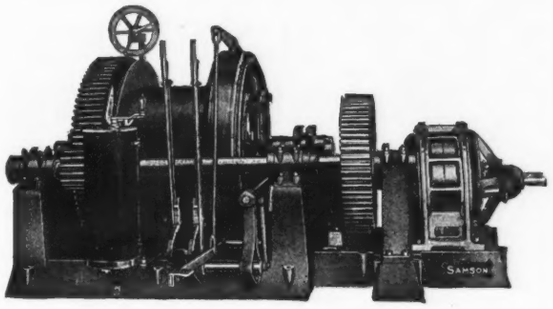

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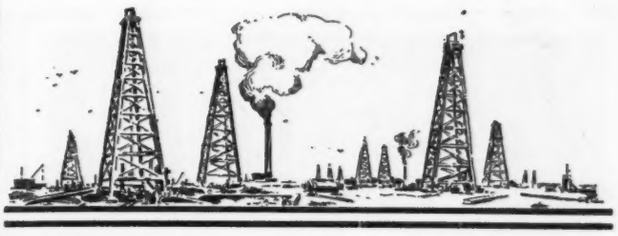

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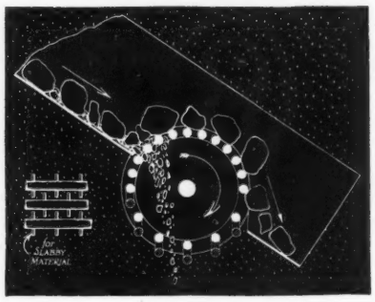

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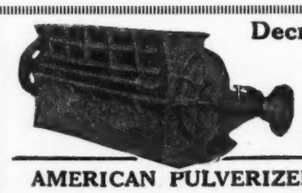

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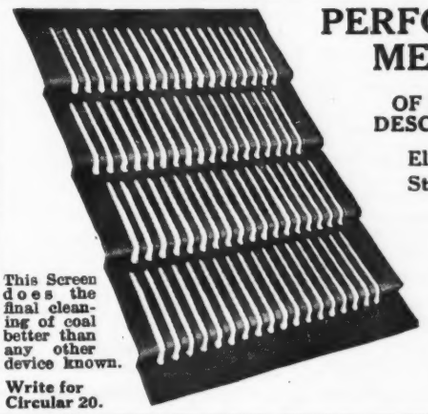

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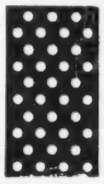

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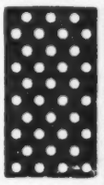

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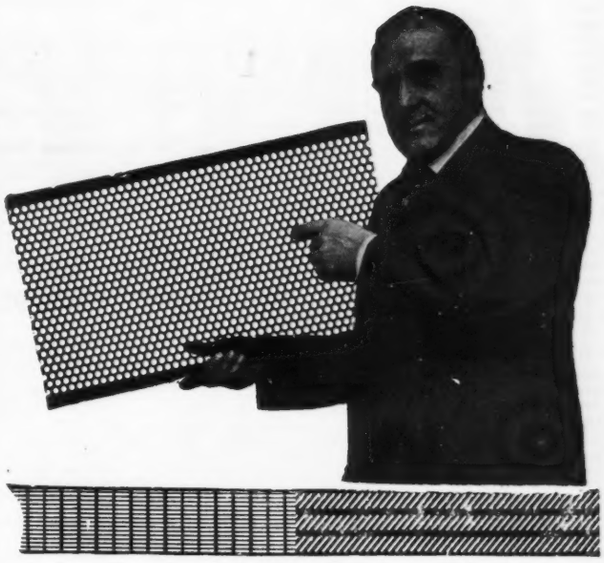

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Leffel Co., James

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Conveying Weigher Co.

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Lunkenheimer Co.

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Berger & Sons Co., C. L.
Buff & Buff Mfg. Co.

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Westinghouse Elec. & Mfg. Co.

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Traylor Engrg. & Mfg. Co.

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James Ore Concent. Co.
Mine & Smelter Supply Co.
Traylor Engrg. & Mfg. Co.
Worthington Pump & Mchy. Corp.

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Allis-Chalmers Mfg. Co.
Vulcan Iron Works

Kilns, Rotary Ore Nodulizers
Ruggles-Coles Engrg. Co.
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Braun Corporation, The
Braun-Knecht-Heimann-Co.
Denver Fire Clay Co.
Mine & Smelter Supply Co.

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Schieren Co., Chas. A.

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Justrite Mfg. Co.

Lamps, Electric
General Electric Co.
Westinghouse Elec. & Mfg. Co.

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Electric Service Supplies Co.

Lamps, Safety Cap
Westinghouse Elec. & Mfg. Co.

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American Metal Co.
American Zinc, Lead & Ref. Co.
American Zinc, Lead & Smlg. Co.
Hardy & Ruperti, Inc., Chas.
United Amer. Metals Corp.
U. S. Smltg. & Refg. & Mining Co.

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General Electric Co.
Westingohuse Elec. & Mfg. Co.

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Ohio Brass Co.
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Queen City Fdy. Co.
Traylor Engrs. & Mfg. Co.

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Jeffrey Mfg. Co., The

Loaders, Wagon
Jeffrey Mfg. Co.
Portable Machy. Co., Inc.

Locomotives, Electric
Genrela Electric Co.
Jeffrey Mfg. Co., The
Westinghouse Elec. & Mfg. Co.

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Atlas Car & Mfg. Co.
General Electric Co.
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Mancha Stor. Batt. Loco. Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Co., Geo. D.

Locomotives, Gasoline
Fate-Root-Heath Co.
Vulcan Iron Works
Whitcomb Co., Geo. D.

Locomotives, Industrial
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General Electric Co.
Jeffrey Mfg. Co., The
Porter Co., H. K.
Whitcomb Co., Geo. D.

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Fate-Root-Heath Co.
General Electric Co.
Jeffrey Mfg. Co., The
Porter Co., H. K.
Westinghouse Elec. & Mfg. Co.
Whitcomb Co., Geo. D.

Locomotives, Steam
Vulcan Iron Works

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Dings Magnetic Sep. Co.

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Magnets, High Intensity
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Mills, Stamp
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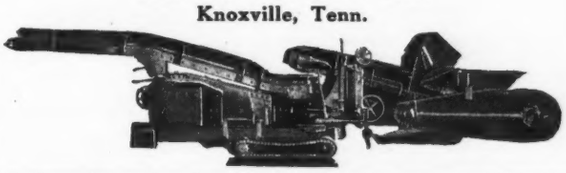

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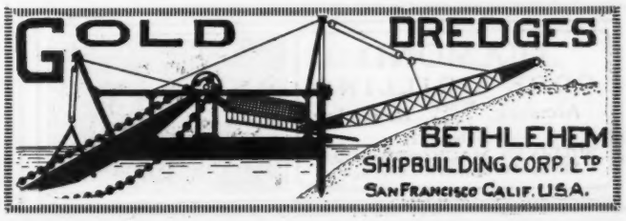

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Smith Co., S. Morgan

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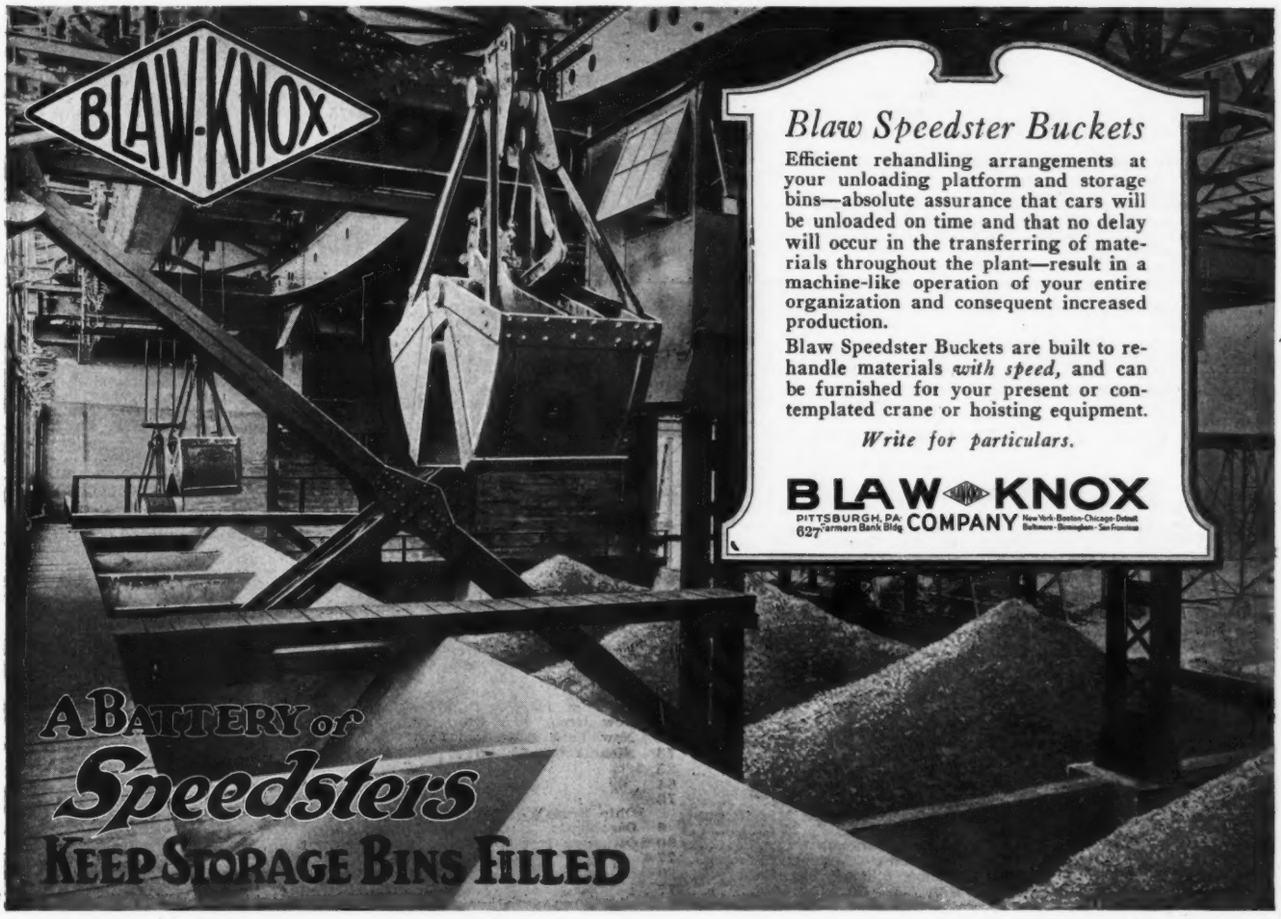

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Hoar Shovel Agency, Inc.
Virginia, Minnesota

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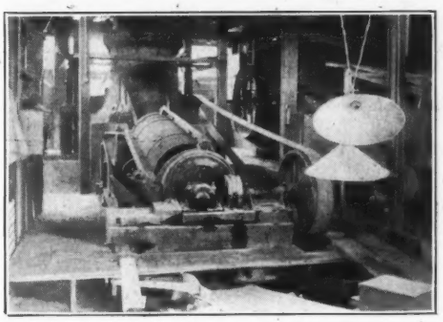

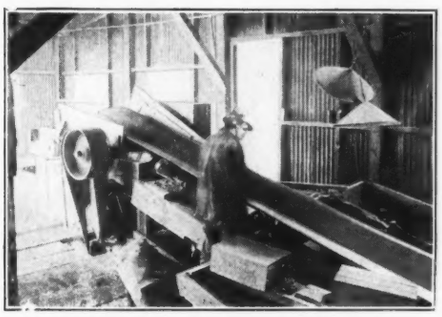

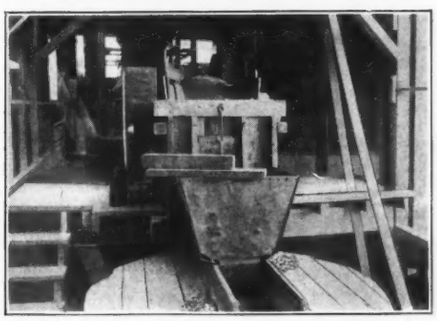

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